April 1929

Electrical Manufacturing

Vol. 3 A Gage Publication No. 4

Here's a *new* name . . .

SYNTHANE

a uniform

LAMINATED BAKELITE

Produced—in a plant built for the purpose.

Tested—to meet exacting standards.

Sold—through the following representatives:

Chicago
J. B. Rittenhouse
32-40 South Clinton St.

Cleveland
C. E. White & Company
Bulkley Building

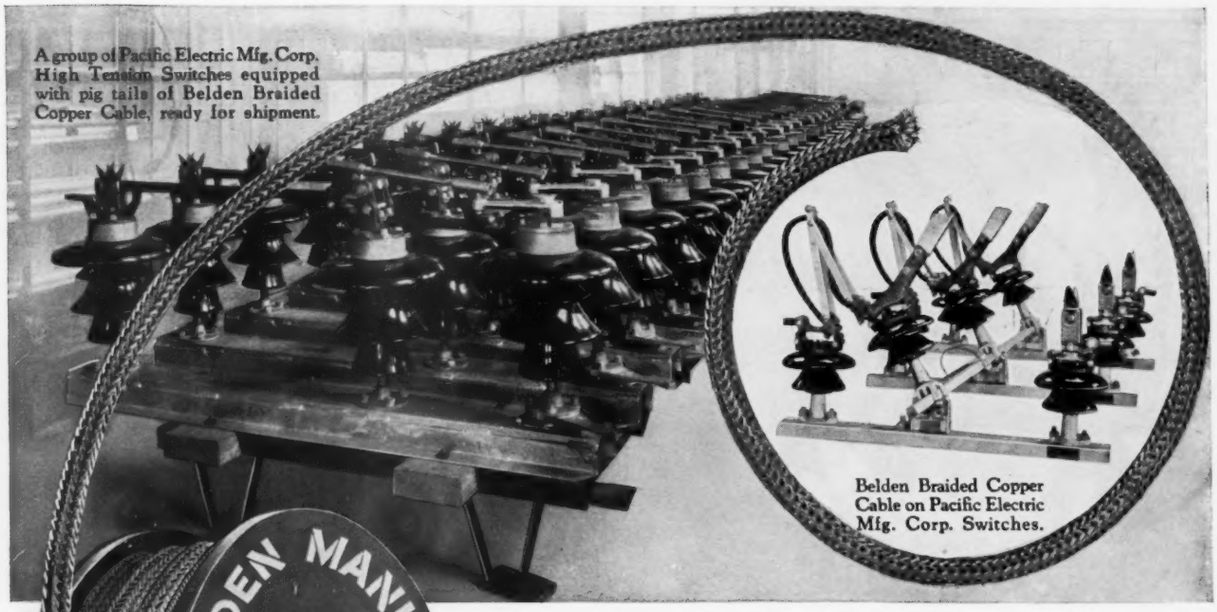
New York
H. G. Blauvelt
Tribune Building
154 Nassau Street

Philadelphia
District
Synthane Corporation
Oaks, Pennsylvania

Synthane Corporation was organized by a group of experienced men for the purpose of concentrating on the production of laminated Bakelite insulation.

Specially designed machinery, genuine Bakelite resins, high-grade raw materials, controlled processes —have made Synthane possible.

SYNTHANE
CORPORATION OAKS · PENNA



A group of Pacific Electric Mfg. Corp. High Tension Switches equipped with pig tails of Belden Braided Copper Cable, ready for shipment.

Belden Braided Copper Cable on Pacific Electric Mfg. Corp. Switches.

A Complete Wire Service for Pacific Electric Mfg. Corp.

The extensive and exacting requirements of the Pacific Electric Manufacturing Corporation are met perfectly by the Belden Complete Wire Service.

Heavy braided flexible cable for use on air break switches; flexible cable for fuse supports; flexible cable for pig tails on the arcing tips of circuit breakers; magnet wire for trip coils and current transformers; and rubber covered wires for switchboard panels are some of the items furnished.

When it is considered that the Pacific Electric Manufacturing Corporation maintains a complete testing laboratory with voltages up to 500,000, and amperes up to 20,000; equipment for measuring torques, transient vibrations and other tests, as well as fatigue testing machines, its extensive use of Belden Materials over a number of years speaks volumes for Belden Quality.

You should know about the Complete Belden Wire Service. Write for information.

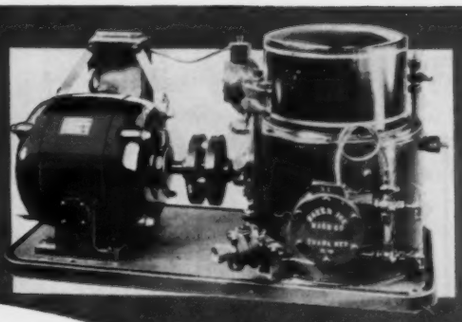
BELDEN PRODUCTS

Beldenamel and Textile Magnet Wire
Coil Windings
Beldenmold
(Molded Bakelite Products)
Automotive Wires and Cables
Airplane Assemblies
Radio Wires, Cords and Cables
Rubber Covered Wires
Armored Cables
Flexible Armature Wires
Motor Lead Wires
Braided and Stranded Copper Cables
Cotton Sleeving

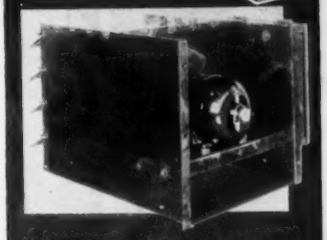
Belden Manufacturing Company

2310-B South Western Ave. Chicago, Ill.

Specify Belden



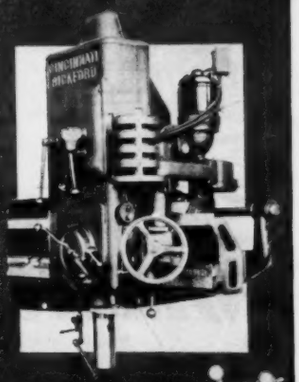
Buy Satisfaction

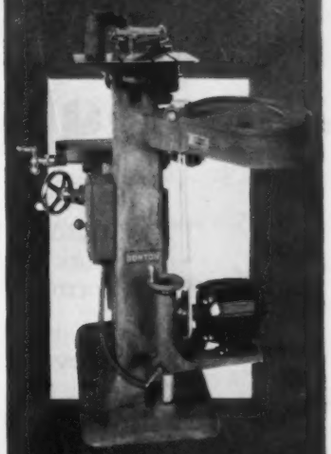


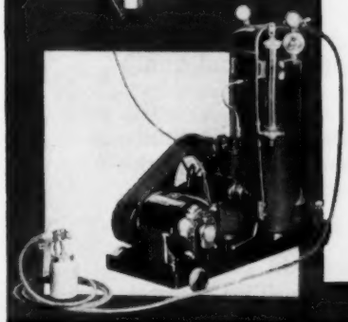
INTO the building of each Master Motor goes something more than sound engineering, expert designing and the finest of materials. That subtle something is the spirit of the Master Workman—a spirit born of pride in the product their skill is helping to create and happiness in the conditions under which they work. Only such a spirit can produce a motor that gives the satisfaction Master users enjoy.

Add to this a continual striving for improvements that assure longer motor life and lower maintenance costs and you will know why, when you buy a Master Motor, you buy satisfaction.

THE MASTER ELECTRIC COMPANY
Dayton, Ohio.







STOCKS CARRIED IN PRINCIPAL CITIES

More Than 70 Service Stations

MASTER GUARANTEED MOTORS

1/20 TO 10 H.P. Dayton THE MASTER ELECTRIC CO. Ohio **Less than 40°**

Research
-constantly *improves* FORMICA

THIS picture shows a corner of the Formica laboratories where fundamental work in the improvement of the physical, chemical and electrical qualities of Formica is constantly going forward.

Important advances in improving the workability of the material while maintaining previous high standards of electrical quality have been made here; the appearance of the material has been greatly improved; controls have been perfected that assure unusual uniformity.

Formica is the leading organization in its field with the largest equipment, largest volume of business, and largest specialized organization. The plant is near the center of industry and can deliver promptly.

THE FORMICA INSULATION COMPANY
4638 Spring Grove Avenue Cincinnati, Ohio

FORMICA

Electrical Manufacturing

Reg. U. S. Patent Office

Volume 3 APRIL, 1929 Number 4

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Consulting Engineering Editor

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William W. Baxter, *Associate Editor* — Roger L. Knight, *Associate Editor*

Irwin Robinson, *News Editor* — Edward H. Dutcher, *Production Editor*

Electrical Manufacturing's editorial program has the following objectives:

Production

To help all electrical manufacturers, including makers of motor-driven products, increase the product's salability, cut unit production costs, quicken turnover, reduce overhead expenses, establish standard methods of work, and spread a better knowledge of raw materials and parts.

Marketing

To spread a better knowledge of and aid electrical manufacturers in adjusting sales management to the buyers' market, to aid in making advertising more effective, finding the most profitable distribution channels, and promoting cooperative market development.

Administration

To further the working out of sounder management policies and better executive control, coordinating sales and production schedules, promoting research, and developing better industry relations.

Repairing

To help all motor repair shops to build better business by developing a sounder organization, improving management, policies and methods, and developing a keener merchandising point-of-view on the business.

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The Sign of the Horse Head

==and Die Casting

AT the sign of the Horse Head, for over sixty years, users of Slab Zinc have been wont to stop and purchase their wares. Quality—*uniform quality*—has made Horse Head the standard high=grade zinc. So die casting, an industrial youngster, looks to the uniform quality of Horse Head Zinc for the successful production of quality zinc base die castings.

THE NEW JERSEY ZINC SALES CO.
160 FRONT STREET, NEW YORK CITY

Zinc Metals and Alloys = Rolled Zinc = Zinc Pigments = Sulphuric Acid = Spiegeleisen

GAIR

CORRUGATED AND FIBRE SHIPPING CASE DISTRIBUTION

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New York City

Boston Office
No. 10 High Street

Philadelphia Office
Liberty Trust Bldg.

Buffalo Office
Crosby Building

Baltimore Office
Court Square Bldg.

Chicago Office
Builders Bldg.

San Francisco Office
Monadnock Bldg.

Tonawanda Office
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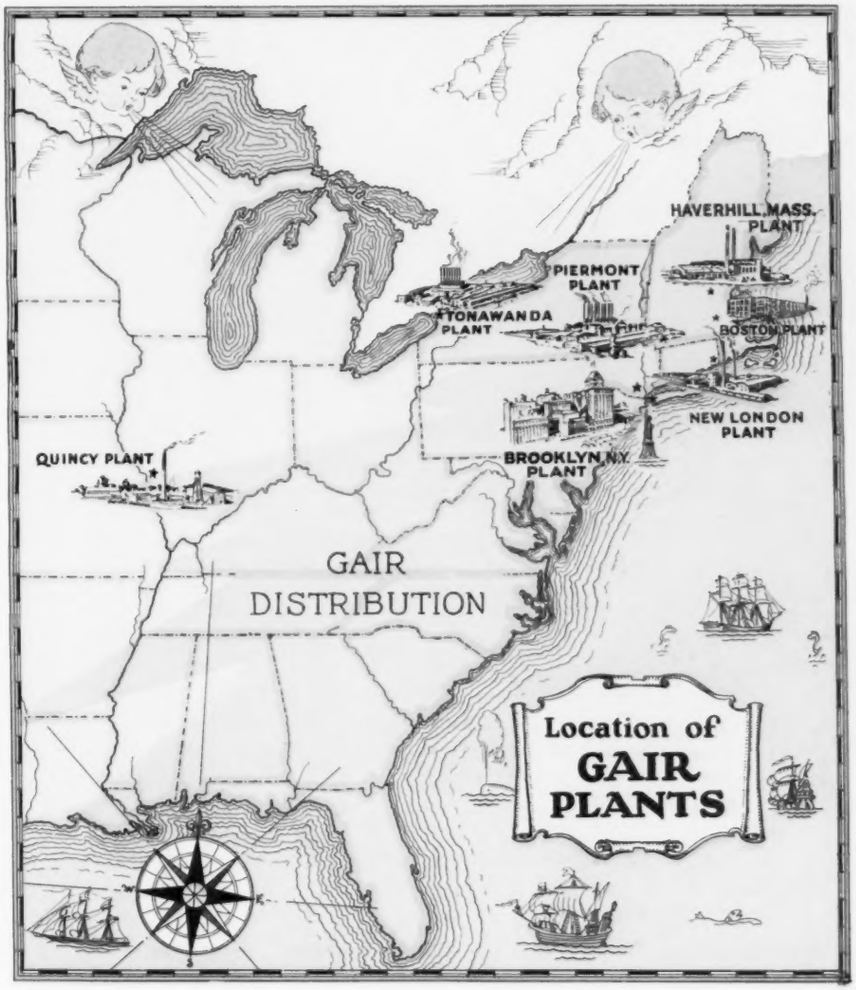


Mills and Factories

Interstate Division
Corrugated Cases
Brooklyn, N. Y.

Piermont Division
Fibre Containers
Piermont, N. Y.

Thames River Division
Corrugated Cases
New London, Conn.

Haverhill Division
Haverhill, Mass.

Warner & Childs Division
Corrugated Cases
Boston, Mass.

Quincy Division
Quincy, Ill.

Tonawanda Division
Tonawanda, N. Y.

GAIR Corrugated Cases and Solid Fibre Containers are produced in four huge self-contained Plants together more than one mile in length, not counting the large resources of three additional Gair Mills noted for the extraordinary toughness of their Jute Liner and the quality of their Straw.

These Plants are organized to the peak of efficiency. There intelligent direction and high mechanical energy have developed an extensive output, which reaches the principal industrial sections of the country.

Our field men are experts in packing-room practice. If there is hidden waste in the structure of your Corrugated Case or Solid Fibre Container, they can uncover it. They know the weak points and can make your box secure. Get the most out of the trade slogan or advertisement on your Shipping Case by the apt use of color and arrangement. Our Creative and Design Department are ready with interesting advice.

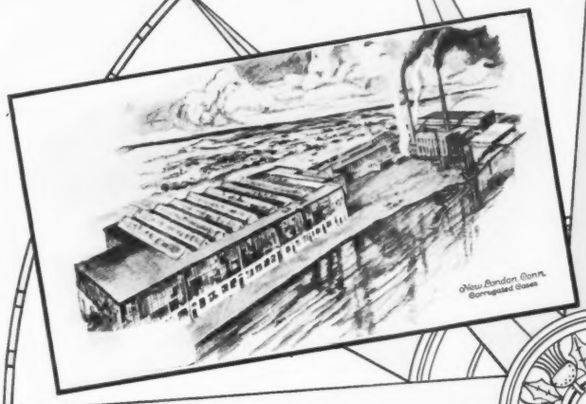
Sixty-five years of packaging practice.

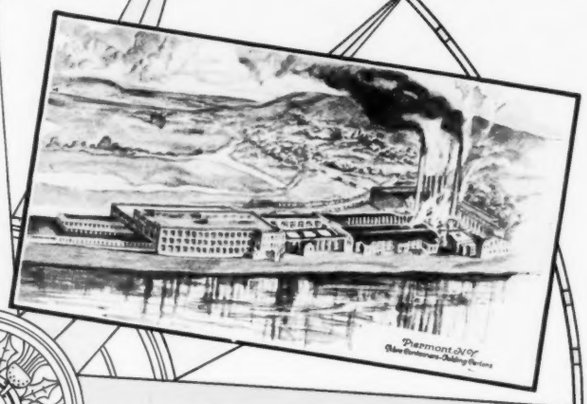
ROBERT GAIR COMPANY

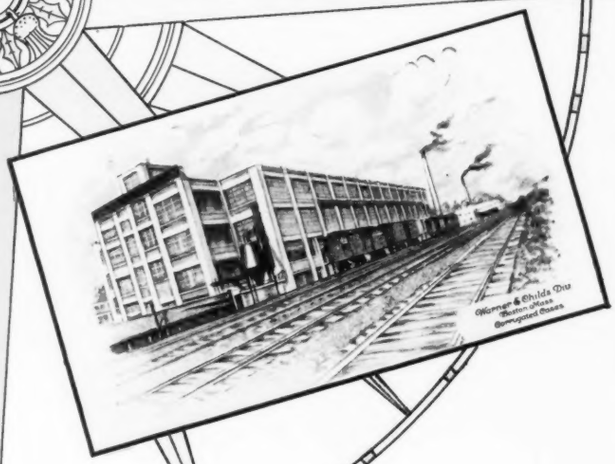
420 LEXINGTON AVE., NEW YORK CITY

GAIR

CORRUGATED AND FIBRE SHIPPING CASE DISTRIBUTION







AS a user of Corrugated Cases and Solid Fibre Containers, you are familiar with the two-headed problem of holding down your inventory and of maintaining a quick, dependable service from a satisfactory source.

Service consciousness is strong in the Gair Plants—the resources for rendering it are abundant and complete. They are operated under one executive control, one formula for uniformity and one method of manufacture on standardized machinery. There is no multiplication of effort nor duplication of processes—the production forces of the seven Gair Plants are principled on wide distribution. They are not half-way fabricating plants. The reach of the Gair Plants is far—distribution is extended by their ability to serve fast and well.

Sixty-five years of packaging practice.

ROBERT GAIR COMPANY

420 LEXINGTON AVE., NEW YORK CITY

1000 TONS
OF MAGNET WIRE

THAT'S the stock of standard magnet wires required to serve adequately the needs of Dudlo customers.

Besides the factory stock shown here, there are also large supplies in nine other cities from coast to coast.

With forty-eight sizes and shapes, thirty-one different styles of insulation, and fourteen distinct types of wire, it is not difficult to understand why so large a stock is necessary to give prompt shipment on volume orders.

But even with this great reservoir to draw on, it is always well to anticipate your requirements in advance, as we do sometimes have a "run" on a certain specification wire which exhausts even this enormous supply.

Samples, prices and shipping information sent promptly on request.

DUDLO MANUFACTURING COMPANY
FORT WAYNE, INDIANA
Division of
GENERAL CABLE CORPORATION

DUDLO

A NEW PAGE IN

235 MEGOHMS PER INCH RESISTANCE!

OVER 530 VOLTS PER MIL BREAKDOWN!

LOWEST WEIGHT!

NOT AFFECTED BY ACIDS!

GREAT STRENGTH!

PANELYTE

FIRE RESISTING!

Panelyte is not laminated and not brittle. Vibration proof. Absolutely non-warping under all atmospheric conditions. True to the thousandth of an inch. Uniform structure.

Weight 80 lbs. per cu. ft. About half that of other panels. Lower freight charges. Works as easily as brass with clean cut holes. Taps and threads cleanly.

When polished, it looks like black marble. Unaffected by acids (including sulphuric), water, oil and steam.

Tensile strength—over 3000 lbs. per sq. in. Transverse modulus of rupture —8200 lbs. per sq. in.

Insulation Resistance 70,000,000 megohms per 1" cube. Compare! 530 volts per mil breakdown!

Can be accurately embossed.

Fire resisting.

Lower cost than any other panel material.

Beautiful appearance, either satin or polished.

We believe it is to your advantage to investigate "PANELYTE"

INSULATION HISTORY

A NEW MATERIAL WITH THE FINE POINTS OF ALL ITS PREDECESSORS

THAT sounds like a rash statement perhaps. Yet—tests by the Electrical Testing Laboratories and by the Underwriters Laboratories prove Panelyte's superiority.

In addition to the list of specifications on the opposite page, we might mention:

"Panelyte" is supplied in accurate, uniform sheets of standard dimensions in all thicknesses from ⅛" to 2" or even thicker if required.

"Panelyte" can be worked very readily—machined, drilled, tapped or threaded, with no ragged edges.

Freight rates are very low, because "Panelyte" weighs only half as much as the usual panel materials.

We will supply a sample for your own tests if desired, or will make up a sample unit for your product. Write.

HUNDREDS OF USES

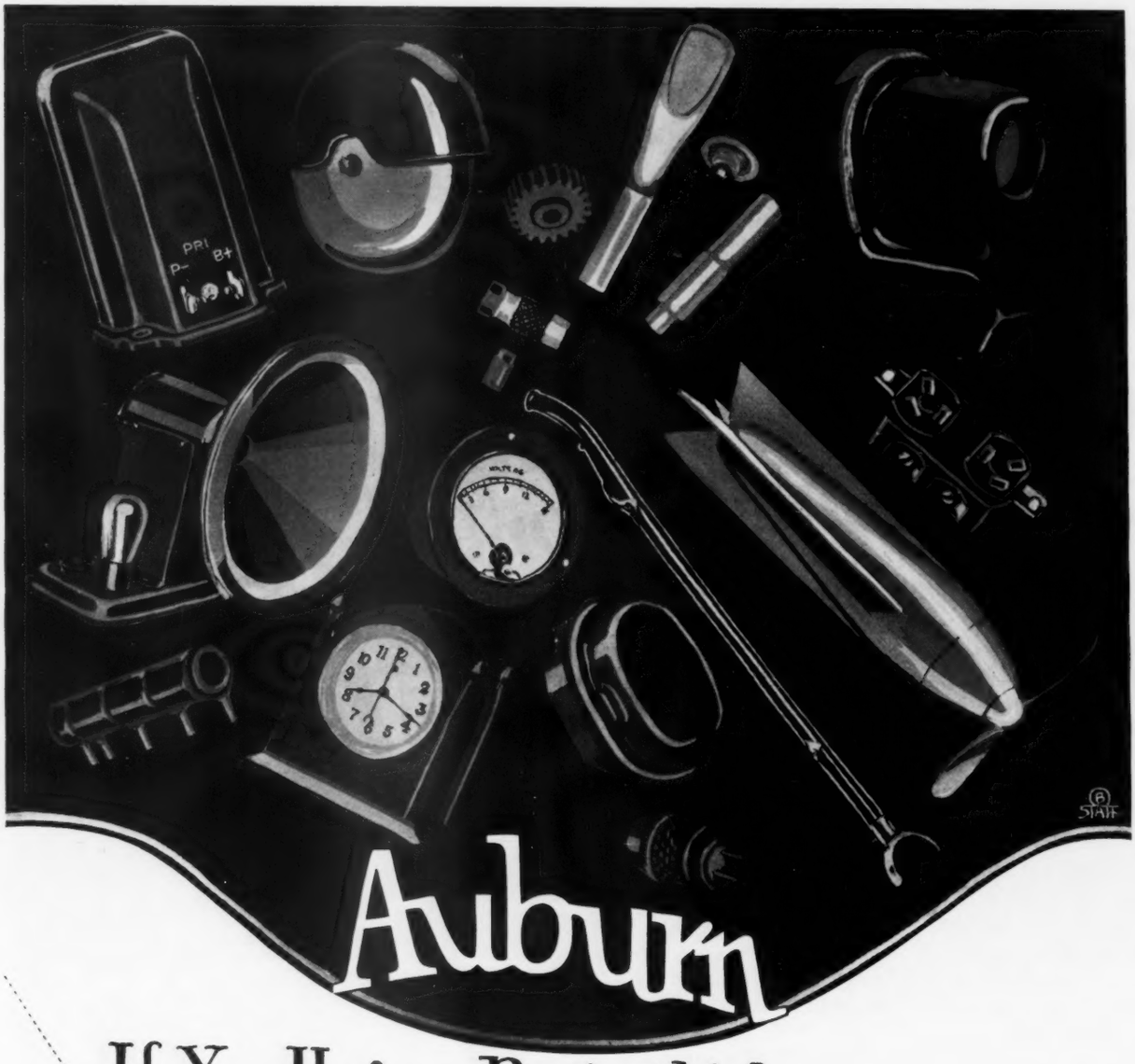
Switchboard Panels
Electric Elevator Controls
Charging Rheostats
Busbar Supports
Telephone Connecting Blocks
Distribution Boards
Fuse Blocks
Shunt Bases
High Wattage Switch Housings
Radio Panels
Switch Cell Construction
Exciter Panels
Solenoid Switches
Terminal Blocks
Converter Panels
Back Connected Switches
Faces for Rheostats
Medical Instrument Panels
Industrial Control Panels

PANELYTE

PANELYTE CORPORATION

Main Office and Works

TRENTON, NEW JERSEY



If You Have a Part which Can be Molded ~ *Write Us !*

Auburn Button Works, Inc.
Auburn, N. Y.

Send us your Booklet, "Is Celluloid or Bakelite Applicable to your Business?" free of obligation or cost.

Name.....

Firm.....

Position.....

City.....

State.....

It matters not whether it is to be made of Genuine Bakelite—Celluloid or any Phenolic compound—or what its shape or color.

We have one of the most modern facilities for such work in the country.

Can make satisfactory deliveries and interesting prices.

Let us figure and you be the judge.

Send us samples, drawings or models with specifications
We will do the rest.

Bakelite & Celluloid Division
of
Auburn Button Works, Inc.
Molders since 1876
Auburn, N. Y.
Representatives in important cities

TORRINGTON BALL BEARINGS

IF YOU were a manufacturer of airplanes you would be very certain that every phase of equipment would operate dependably under even unusual conditions. Human life may not depend upon the smooth, accurate functioning of your machines, yet profits, the life of industry, may be directly involved.

That lends an importance to the selection of ball bearings which is shared by the Torrington policy. The standards set for Torrington Ball Bearings include scrupulously selected materials, finely constructed by remarkable precision methods.

Place these ball bearings at important parts of your equipment. They will carry every stress load with impressive ease and smoothness.

GLIDER-SWIFT

DISTRICT SALES REPRESENTATIVES:

S. W. ANDERSON
565 W. Washington Blvd.
Chicago, Ill.

GIBSON & HODGSON
2315 Dime Bank Bldg.
Detroit, Mich.

The Torrington Company
ESTABLISHED 1866
Torrington, Conn., U.S.A.

A NEW NAME

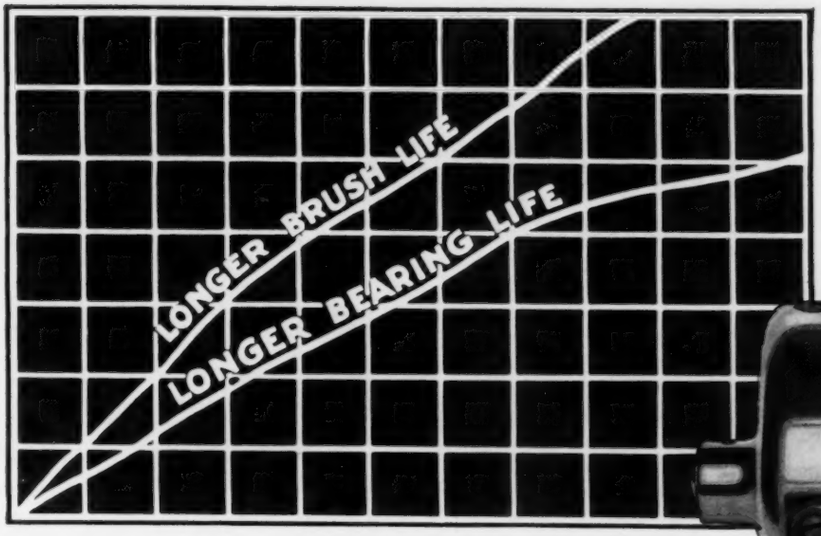
more fitting the products

The Dumore Company

THE Wisconsin Electric Company of Racine, Wisconsin, manufacturers of Dumore High-Speed Grinders, Dumore Fractional Horsepower Motors, and Dumore Dental and Jewelry Equipment, announces a change in its corporate name. After March 1, 1929, the company will be known as The Dumore Company. The present officers, personnel and policies will be maintained.

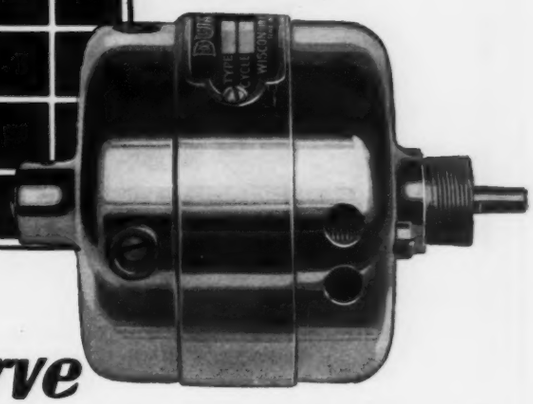
Dynamic balance of Dumore Armatures is secured on special balancing machines of our own design and construction. Smoothness, quietness and reduction of bearing trouble to a minimum are thus assured in all Dumore Motors.

DUMORE



Dumore Motors are Used in —

Electric Vacuum Cleaners
Electric Floor Polishers
Sewing Machines
Oil Burners
Grinders
Drills
Drink Mixers
Dental Engines



Controlling the curve is a matter of "Motor-making"

FEW products are called upon to operate more dependably . . . more consistently . . . *than motors.* They must give unfailing service to be satisfactory, regardless of what the work may be . . . and they must serve a wide range of usefulness.

With this assignment, the Dumore Motor goes into the field with every confidence, for it is *made to give unparalleled service . . . . made to last longer.*

More than a quarter of a century of *motor-making* experience is back of Dumore Motors. Naturally, the benefits of all these years of developing the Universal high-speed motor gives Dumore a decided advantage.

Think of it, every Dumore Motor passes numerous tests and inspections . . . each armature is dynamically balanced. This assures you the deliverance of smooth, quiet, vibrationless power with the minimum of wear on all parts. Perfect control is exercised over every part going into Dumore Motors.

Dumore Motors obtain speeds of from 10,000 to 12,000 R. P. M., but they develop their maximum H. P. at 5,000 to 6,000 R. P. M. For full details and how efficiently Dumore Motors will work when applied to your product, write our Engineering Research Dept.

THE DUMORE COMPANY
35 SIXTEENTH STREET RACINE, WISCONSIN

FRACTIONAL HORSE POWER MOTORS
ARE DYNAMICALLY BALANCED!

We invite inquiries *with blue prints*

BOHNALITE

62% LIGHTER THAN IRON

Introduced nationally but a few months ago, Bohnalite, the new light alloy, is attracting unusual attention.

Manufacturers in all lines of business are familiarizing themselves and their engineering staffs with the advantages of Bohnalite.

We, however, have a suggestion to make: When you send in your inquiry for Bohnalite literature and general Bohnalite information, send along your blue prints and samples if possible at the same time. This will facilitate matters and give you more prompt and more specific information on your requirements.

Bohnalite was developed by Chas. B. Bohn, who for years searched for a substitute for iron without iron's excessive weight.

If your product is made of metal you should know about Bohnalite.

If your product is only partially made of metal you should know about Bohnalite.

If you use metal in your factory you should know about Bohnalite.

This new light alloy is 62% lighter than iron yet it is just as hard.

Bohnalite has high uniform hardness.

Bohnalite has great density.

Bohnalite has a fine grained structure.

Bohnalite has exceptional strength.

Bohnalite is ductile.

Bohnalite has excellent bearing qualities.

Scores of manufacturers are already using Bohnalite in a wide variety of industries.

We have just published a new book which explains this light alloy, illustrates many of its uses and supplies you with detailed physical properties.

In sending for this book, *accompany your inquiry with your blue prints* and samples if possible, then we can give you the prompt service you desire.

BOHN ALUMINUM & BRASS CORPORATION
DETROIT, MICHIGAN

Also manufacturers of Nelson Bohnalite Pistons and Bohn Ring True Bearings

New York Chicago Philadelphia
Cleveland Pittsburgh

CHAS. B. BOHN
The authority who developed Bohnalite

THE WORLD'S GREATEST AND LATEST LIGHT METAL

Our Kokomo, Indiana, Mill manufactures Test Liners and Chipboard for Containers.

Our box factory at Anderson, Indiana, produces quality Corrugated Containers for many States.

EXHIBIT
No. 2 of a Series

BOX FACTORIES AND MILLS
(CORRUGATED and SOLID FIBRE)
of the
CONTAINER CORPORATION
OF AMERICA
and MID-WEST BOX COMPANY
IN INDIANA

OUR Corrugated Box factory at Anderson, Indiana, is the first and oldest of the Mid-West plant group associated with the Container Corporation. Built in 1914 as an experimental plant for the development of an idea—the idea that there are many packers and shippers who would prefer to use dependable, consistent quality corrugated boxes ALL THE TIME if they could get them—it was in 1926 supported by four corrugated box factories and two mills, at that time merged with the Container Corporation of America. The "Consistent Quality" idea was found so good that it was adopted and is today the moving force behind the progress of the Container Corporation.

Anderson supplies quality Corrugated containers to Illinois, Wisconsin, Minnesota, Iowa, Missouri, Michigan and parts of Ohio and Pennsylvania.

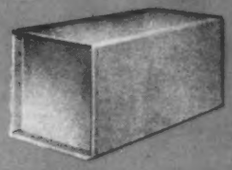
Our Kokomo Mill manufactures Test Liners and Chipboard for shipping containers.

OTHER FACTORIES AND MILLS

at Cleveland, Ohio, Philadelphia (Manayunk), Pa., Fairmont, W. Va., Charleston, W. Va., Cincinnati, Ohio, Circleville, Ohio, Natick, Mass., and Bridgeport, Conn., (except Chicago plants, previously shown in this series). —

WILL BE FEATURED IN LATER INSERTS

A Great Variety of Goods — Fragile, Solid *and* Liquid Now Packed in Fibre Board Containers



Pilferproof Recessed End Shipping Box

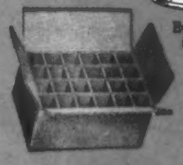
Matches

Shoes

Tobacco, Cigars Cigarettes

Open Chairs

Everything in Cans



Reshipping Case for Bottles and Bottled Goods

Toys — All Kinds

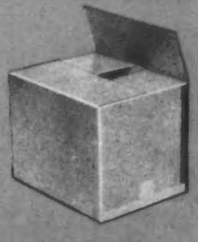
Lamp Wrappers

Electric Light Bulbs

Dry Cell Batteries

Soaps, Washing Powders and Flakes

Milk, Preserves, Etc.



Slotted Carton for all Commodities

Dependable Quality Fibre Shipping Boxes Are Lowest in Cost in the Final Showing

THE reasons for the wide usage of our Corrugated and Solid Fibre shipping containers are based on their many sided economy, strength, protective qualities and endurance. They are known for consistent, dependable quality. Each box is backed by a strong, well equipped organization with twelve box factories and six mills, engaged in the serious business of turning out products that will stay sold strictly on their merits.

Buyers are rare who do not know of the quality of Mid-West corrugated, and everywhere the Container Corporation is known and respected for abilities and highgrade products. Let us help you economize—with better boxes and packing methods. See COUPON.

Some Industries Now Using Our Solid Fibre or Corrugated Boxes

Bakery Goods	Furniture	Shoes
Canners	Stationery	Breakfast Foods
Building Material	Lamps and Shades	Proprietary Remedies
Sporting Goods	Tobacco—all forms	Spices
Books and Magazines	Perfumery	Foods—All Kinds
Toys	Paints and Varnishes	Instruments
Crockery	Automotive	Brooms, Brushes, Etc.
Bottlers	Glassware	Ceramics
Fruit Packing	Insecticides	Leather Goods
Radio Goods	Rubber Goods	Doors
Pictures	Electrical Goods	Hardware
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Soap and Chips and Washing Powders	Carpets and Rugs	Electric Light Bulbs
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OF AMERICA
and MID-WEST BOX COMPANY

111 W. Washington St. **Chicago, Illinois**

Six Mills — Twelve Factories — Capacity over 1200 tons per day

RETURN COUPON

CONTAINER CORPORATION OF AMERICA
111 West Washington Street, Chicago

Gentlemen: Please have one of your experts check our present packing and shipping methods—without obligating us—for the purpose of reducing our costs if possible.

Name_____

Title_____

Firm_____

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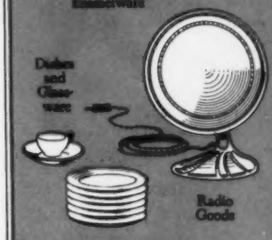

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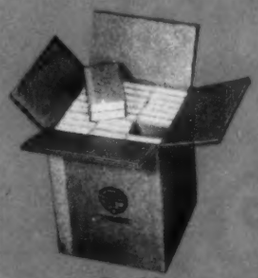
Radio Goods

Electrical Goods

Reflectors



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Wherever goods are manufactured — there you will find our boxes reducing packing and shipping costs.

SCREW MACHINE PRODUCTS that reflect integrity ..... *consistently*

The value to you of specialized co-operation has been proven in many ways—has it been proven in the case of machine parts?

Each of us has his own part to do in eliminating waste in production, and ours is the vital one of furnishing screw machine products by the million—accurate, durable and uniform.

You will find our service and facilities equal to any problem you have. Just send us samples or blue prints and let us quote prices. From 1-16″ to 3″ in iron, steel or brass.

SAMUEL J. SHIMER & SONS
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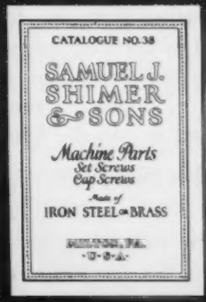
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STAND-BY,* *n. One who, or that which, stands by one in need; something upon which one relies for constant use.*

ACCORDING TO WEBSTER

With or without pedigree; of silken coat or matted with burrs; intelligent or dumb—a Dog symbolizes all that is faithful and trustworthy. As play-fellow for the children; as a hard worker in the hunt, or as guardian of the baby—the Dog is an old *stand-by of man and child.

Industry has its old stand-bys, too. The electric heating industry, for instance, was created in 1906 by the discovery of Chromel, the original nickel-chromium alloy for heating elements. Today, twenty-three years later, Chromel is still the backbone of electric heating devices. In the toaster on the breakfast table, or in the big electric furnace at the factory, Chromel's good behavior is just what you'd expect from an old stand-by.

This reliability of CHROMEL has helped in the production of heating-appliances which so please the user and dealer that they think of the company that made the appliances also as an old *standy-by that produces only that merchandise which is trust-worthy.

If you wish technical information on Chromel, ask for Catalog F. M.

HOSKINS MANUFACTURING COMPANY
4445 Lawton Avenue, Detroit, Michigan
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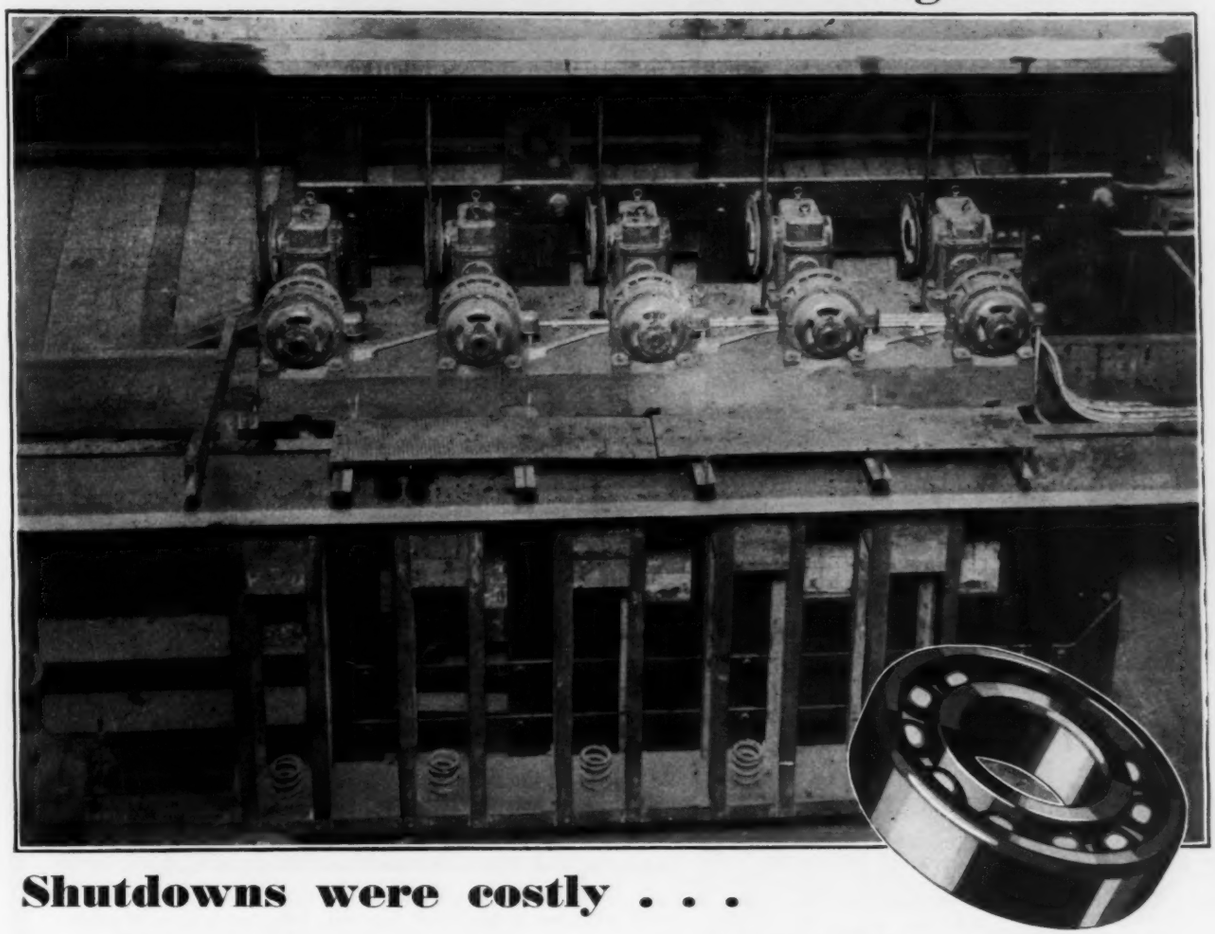
Chromel
MEANS ELECTRIC HEAT

Hoskins Chromel
THE WIRE THAT MADE ELECTRIC HEAT POSSIBLE

Score another Point for Ball Bearing Motors!



Shutdowns were costly . . .

They had to go out!

FREEZING pipes, repacking of pistons . . . . delays attended the operation of the doors to the soaking pits and furnaces of a well-known Cleveland steel mill.

Steel manufacture must be continuous. Even temporary shutdowns imposed heavy penalty. This trouble had to stop.

Engineers then hung the doors on counter-balanced cables driven by electric motors through Horsburgh and Scott Speed Reducers.

And as a final touch of surety, the designer called for New Departure Ball Bearing-General Electric Motors. This last step assured motor operation as dependable mechanically as it was electrically . . . for New Departures not only eliminated the necessity for frequent lubrication over back of these big furnaces but gave the motor longer life by reducing the hazards of short circuits, burnouts and wasteful lubricant leakage.

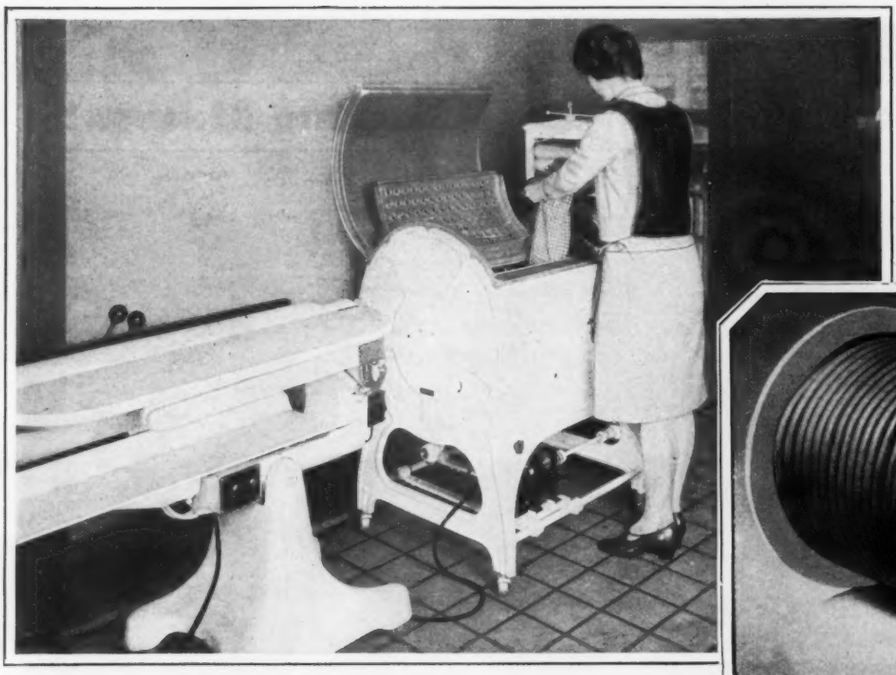
How New Departures accomplish these important advantages by wearproof performance and a permanently correct air gap is an interesting subject, interestingly described in Booklet K, which we will be glad to send you.

May we?

New Departure Ball Bearings

The New Departure Manufacturing Co.
Bristol, Connecticut
Chicago · Detroit · San Francisco

916E

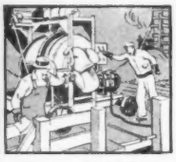


G-E Flex . . . . . .

the electric cord for household appliances

Lighting

Household Appliances



Construction Machinery

Electric Drills

Garages

Offices

Washing Machines

Vacuum Cleaners

Manufacturers of household appliances, of lamps, of office machines, of portable electric tools . . . . all are adopting G-E Flex—the cord that does not kink.

G-E Flex has remarkably long life because it is extremely flexible, resists abrasion, and has high tensile strength. It is all-rubber covered and neither acid, oil nor water will harm it.

It can be obtained on spools or in coils, also in cord sets with moulded rubber plug, permanently attached and ready for assembly. The coupon will bring you further details.

Section W-234, Merchandise Department,
General Electric Company,
Bridgeport, Connecticut.

Please send me full information on G-E Electric cord and Cord Sets.

Name .....

Address .....

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GENERAL ELECTRIC

Electrical Manufacturing

Production - Marketing - Administration - Repairing

Volume 3 **APRIL - 1929** **Number 4**

Charting a *Business Course*

ONCE upon a time in the electrical manufacturing industry, as in all other industries, it was possible to find many executives who believed that if a man concentrated his attention on his own affairs his business would take care of itself and that all would be well with his profits. That type of business executive is passing out rapidly, from all industries. His sun is fast sinking below the horizon forever.

Today the business man who survives knows that he cannot live to himself alone. He knows that he does not have the stream to himself. He knows that he must steer a careful course among economic currents and cross currents which may mean either achievement or disaster for him. He knows that he must constantly check his own course against that of other concerns, that he must help others to solve common problems.

These facts, of course, make faster headway when applied to the internal problems of an industry than when applied broadly to all industries. And yet the electrical manufacturer must never forget that he is part and parcel of industry as a whole, that he must fall into step, or fall out, with manufacturers in other fields, that there are times when he must sit down with the executives of other industries and tackle the questions that trouble all. An opportunity to do this, to study many of the currents and cross currents of modern business, lies in the meeting of the Chamber of Commerce of the United States which meets in Washington, D. C., April 29 to May 3. Below are subjects to be discussed around the table, by business men from a practical business point of view. The electrical manufacturing industry should be represented at these conferences.

TUESDAY, APRIL 30

Marketing of Agricultural Products

Broadening Cooperation in Marketing.
Developing Marketing Systems at Public Expense.
Taxing and Regulating Marketing Agencies.

Trade Practice Conferences

Eliminating Unfair or Uneconomic Business Practices Through Conferences.
Trade Association Promotion of Improved Business Practices.
Preparations for a Trade Practice Conference.
Enforcement of Agreements.
Federal Law in Relation to Trade Practice Conferences.

Industrial Expansion in Relation to Manufacturing Capacity

Problems of Excess Manufacturing Capacity.
Modernizing Existing Plants.
Elements of Community Industrial Expansion.

Government and Transportation

Relieving Handicaps to American Shipping.
Rail and Ocean Rates and Export Markets.
Legislative Rate Making.
Aeronautics as an Aid to International Trade.

Government's Relation to Raw Materials and Water Power

Anti-trust Acts in Relation to Overproduction—Forest, Coal, Oil, and Metal.
Private and Government Means for Stabilizing Production.
Government Ownership Interference with Sound Development —Water Power, Fertilizer, Oil, Forest.

Planning and Financing the Modern City

City Planning for the Future.
Planning Long-time Capital Expenditure Programs.
Pay-as-you-go vs. Bond Issues.
Budgeting for Year-round Fiscal Control.
Business Group Relations to City Planning and Financing.

WEDNESDAY, MAY 1

Mass Merchandising—Producer, Distributor and Consumer

Distribution Changes Due to Mergers.
Wholesaler-Retailer Cooperatives.
The Future of Chain Organizations.
Mass Buying and Selling Policies.
The Influence of Consumer Demand.
Style vs. Standardization.

Business Finance and the Credit Supply

The Credit Supply and Speculation.
The Federal Reserve and the Security Market.
New Developments in Corporate Finance.
Significance of the Revised Dawes Plan.
Community Efforts to Protect Purchasing Power by Fighting Financial Stakes.

Tariff Principles

The Tariff and Industrial and Agricultural Activity.
The Flexibility of Our Tariff.
The Need for Foreign Trade Zones.
Parcel Post with Cuba.
Export and Import Prohibitions and Restrictions.

Traffic in the City and Its Trade Area

Business Efforts for Immediate Traffic Relief.
Parking and Retail Business.
Ultimate Remedies for the Traffic Problem.
Preparing and Financing Road Programs.

Employer-Employee Relations

Employee Retirement Plans.
The Value of Extra-incentive Systems
Current Placement Problems.
Readjustments Caused by Mechanization.

Cooperative Efforts to Conserve Life and Property

Fire Prevention Experiences.
Street and Highway Accident Prevention.
Compulsory Automobile Insurance.
Automobile Thefts.
Community and Business Public Health Campaigns.

Loyalty to His Company
Faith in His Chosen Profession
Justice to All with Whom He Deals—is the

Principles and Standards of Purchasing Practice

Advocated by

National Association of Purchasing Agents

1—To consider, first, the interests of his company in all transactions and to carry out and believe in its established policies.

2—To be receptive to competent counsel from his colleagues and to be guided by such counsel without impairing the dignity and responsibility of his office.

3—To buy without prejudice, seeking to obtain the maximum ultimate value for each dollar of expenditure.

4—To strive consistently for knowledge of the materials and processes of manufacture, and to establish practical methods for the conduct of his office.

5—To subscribe to and work for honesty and truth in buying and selling, and to denounce all forms and manifestations of commercial bribery.

6—To accord a prompt and courteous reception, so far as conditions will permit, to all who call on a legitimate business mission.

7—To respect his obligations and to require that obligations to him and to his concern be respected, consistent with good business practice.

8—To avoid sharp practice.

9—To counsel and assist fellow purchasing agents in the performance of their duties, whenever occasion permits.

10—To co-operate with all organizations and individuals engaged in activities designed to enhance the development and standing of purchasing.

The National Association of Purchasing Agents not only functions for the benefit of those engaged in the buying or selling of merchandise, but at the same time it is very active in many other lines of endeavor, such as simplified practice, uniform specifications and legislative matters

THE National Association of Purchasing Agents is a cooperative organization of professional buyers, totalling nearly 5000 in this country, Canada, and Mexico. Of this number, approximately 1000 purchase some form of electrical machinery or supplies. Naturally, the total purchases for each company range according to its size and needs, but as an indication of the tremendous sums which some buyers spend, I need only refer to the recent announcement of one member that during the preceding twelve-month period his department had spent twelve and one-half millions for electrical and mechanical equipment; $1,500,000 for copper wire and cables; $150,000 for aluminum cables; $514,000 for steel pipe; $318,000 for cast iron pipe; $3,000,000 for appliances; $450,000 for lamps; $232,000 for automotive equipment; $91,000 for rails; $29,000 for fibre conduit, $43,000 for cross arms, $100,000 for line hardware; $50,000 for galvanized strand.

Of course, this may be considered the exception rather than the rule, for this particular organization did the buying for a chain of utilities. And yet, if the facts were available, I do not question but that these figures would be equalled or even surpassed by other public utility buyers holding membership in this Association.

In its representation of the industrial consumer, the National Association of Purchasing Agents occupies an almost unique position. It is the only association organized and controlled exclusively by purchasing agents and expressing their viewpoint at all times, and including in its membership representative buyers from every type of business, educational and governmental organizations, and semi-public institutions. Geographically, these men are located in the major industrial and commercial centers of the countries heretofore mentioned. They are members of the fifty-seven affiliated local associations which compose the National.

With the exception of the United States Department of Commerce the N. A. P. A. is one of the foremost proponents of simplification and standardization.

FOR purposes of better service to the individual and general business welfare, the organization of groups, consisting of those engaged in the same or closely allied fields has been encouraged and fostered within the Association. Such groups as the Public Utility, Oil Company Buyers, Governmental Buyers, Bank and Insurance Companies, Mining, Smelting and Refining, etc., already have strongly organized units. In addition commodity committees have been appointed for the consideration of any problem or interest affecting the buyer of these products. How the work of these committees and groups directly benefits the buyer and industry will subsequently be indicated.

The increasing importance of the purchasing function has *ipso facto* correspondingly increased the responsibilities of the purchasing agent, and the National Association of Purchasing Agents, being the recognized spokesman for the profession, has endeavored to assume its full share in its service to members and their firms. That its efforts in the past may be considered a pledge for the future brings us now to a brief review of some of the high spots of the Association's accomplishments and interests:

With the exception of the United States Department of Commerce, the N.A.P.A. is considered one of the foremost proponents of commercial standardization and simplification

Purchasing Agent's Creed

Ten Standards for Buying and Selling

Advocated by

National Association of Purchasing Agents

1—To buy and sell on the basis of value, recognizing that value represents that combination of quality, service and price which assures greatest ultimate economy to the user.

2—To respect our obligations and neither expressly nor impliedly to promise a performance which we cannot reasonably expect to fulfill.

3—To avoid misrepresentation and sharp practice in our purchases and sales, recognizing that permanent business relations can be maintained only on a structure of honesty and fair dealing.

4—To be courteous and considerate to those with whom we deal, to be prompt and businesslike in our appointments, and to carry on negotiations with all reasonable expedition so as to avoid trespassing on the rights of others to the time of buyers and salesmen.

5—To avoid statements tending to injure or discredit a legitimate competitor, and to divulge no information acquired in confidence with the intent of giving or receiving an unfair advantage in a competitive business transaction.

6—To strive for simplification and standardization within the bounds of utility and industrial economy, and to further the development of products and methods which will improve industrial efficiency.

7—To recognize that character is the greatest asset in commerce, and to give it major consideration in the selection of customers and source of supply.

8—To adjust claims and settle disputes on the basis of facts and fairness, to submit the facts to arbitration if a mutual agreement cannot be reached, to abide by the decision of the arbiters and to resort to legal measures in commercial disputes only when the preceding courses prove ineffective.

9—To provide or accept no gifts or entertainment in the guise of sales expense, where the intent or effect is to unduly prejudice the recipient in favor of the donor as against legitimate competitors.

10—To give or receive no bribes, in the form of money or otherwise, in any commercial transaction, and to expose commercial bribery wherever encountered for the purpose of maintaining the highest standard of ethics in industry.

A. M. Bowman

President, National Association of Purchasing Agents, Inc., Humble Oil & Refining Company, Houston, Tex.

The Simplified Invoice, Standard Purchase Order, Standard Catalog, Standard Conveyor Contract, Standard Coal Contract Form, and the Standard Iron and Steel Scrap Specifications have resulted from the efforts of our committees. Our Association is given committee representation on most every simplification project sponsored by the Department of Commerce. It is one of the few organizations honored by individual representation on the Planning Committee of the Division of Simplified Practice of the Department of Commerce. This Division sponsors and supervises all simplification activities.

The Association also works very closely with the Federal Specifications Board in the preparation and development of adequate specifications for government and industrial use. It is recognized that mass-production pre-supposes mass-consumption, and wherever possible the use of Federal Specifications in place of individual specifications is encouraged so that American manufacturers may effect the economies of mass production. Not long ago the Association was one of the active participants in the compilation and preparation of the Dictionary of Specifications issued by the Department of Commerce.

Almost from its inception the N.A.P.A. has vitally concerned itself with National as well as industrial welfare. In its early years, it participated in many wartime emergency

measures, developing some of the provisions of the Priorities Act. At present it is working with the Ordnance Department of the United States Army in the establishment of an emergency procurement service which will function in the event of war. These services are typical. Between these two illustrations, there is recorded a long list of achievements and satisfactory work by the Association in behalf of the Nation and its industries.

¶ The N. A. P. A. has been very active in developing centralized purchasing in many states and has done much to combat misrepresentation of foreign merchandise.

AT this point, special mention should be made of the constant campaign which is waged in the interest of business-like methods in government. The Association has helped establish centralized purchasing in many States, cities, and minor civic divisions. In certain cases, it has helped prepare the measures under which centralized purchasing has become effective in some governments.

The Governmental group of our Association is continuing this effective work and is sponsoring a program of tremendous value to the entire nation and the individual tax payer. Just recently, the bill to provide centralization of Federal Purchases, for which the N. A. P. A. committee had labored for three years was passed by Congress. It is estimated that this measure will provide an annual saving of fifteen million dollars on the one hundred million dollars of purchases which the Federal Government makes yearly. In Missouri, Wisconsin, Chicago, and Philadelphia, centralization measures are now pending.

In other legislative matters, the Association has been instrumental in directing the attention of State and Federal legislatures to the need for laws against commercial bribery. It is also actively engaged in fostering commercial arbitration.

The Association has cooperated very closely with the Federal Trade Commission on many important matters and has been termed by a former member of the Commission as "the foremost of all industrial associations in the campaign for better business." It may be remembered that the Association originated and participated in the campaign to abolish "Pittsburgh Plus."

In opposing commercial abuses the N. A. P. A. has been particularly active. The so-called "Long Price-List for Paper" which would have imposed a heavy premium on all buyers of paper outside the printing and related industries, was abolished solely through the effort of our Association. Another example is the current campaign against certain foreign sales agents. These men, by the use of misleading order forms and through misrepresentation in the sale of tool steel, packing, and files, have sought to defraud American Buyers of large sums. Through publicity and other measures the activities of these salesmen have been frustrated in many cases.

¶ The N. A. P. A. has not alone concerned itself with striving for the welfare of present purchasing agents but it is encouraging college courses in purchasing.

MENTION of these commodities brings to mind the commodity research work in which the Association has made a name for itself. Its accomplishments and work along these lines are too extensive for discussion here, but a few things may be cited as typical. On coal, the Association has from time to time called producers and consumers together to adjust important problems. Witness, the Standard Coal Contract Form. The monthly coal report issued by the Association is another achievement.

In the lumber field the Association has constantly protected and represented the interests of buyers on the questions of grading and standards. A short time ago, the Association's Lumber Committee successfully opposed a revision of standards which would have been detrimental to the interests of lumber buyers.

On iron and steel, the Association has been equally of service, participating in many conferences for improved standards and specifications. The recent nation-wide revision of iron and steel scrap specifications was instigated and most all the work assumed by the Association.

In the textile, chemical, and other fields the Association has been similarly active. In fact, there is scarcely a major commodity field in which some constructive work by our Association has not been done. The full value of these efforts, however, is not always appreciated at once, for such work requires time before the results become apparent.

The Association has not alone concerned itself with the task of vigilantly striving for the welfare of present purchasing agents and industry, but with foresight, it has encouraged and supported courses on purchasing in many universities and business schools. Aside from the technique and science of purchasing which is taught in all these classes, the Association is seeking to inculcate the high standard of ethics to which the membership is pledged. These ethical principles are embodied in the "Principles and Standards of Purchasing Practice" of the Association.

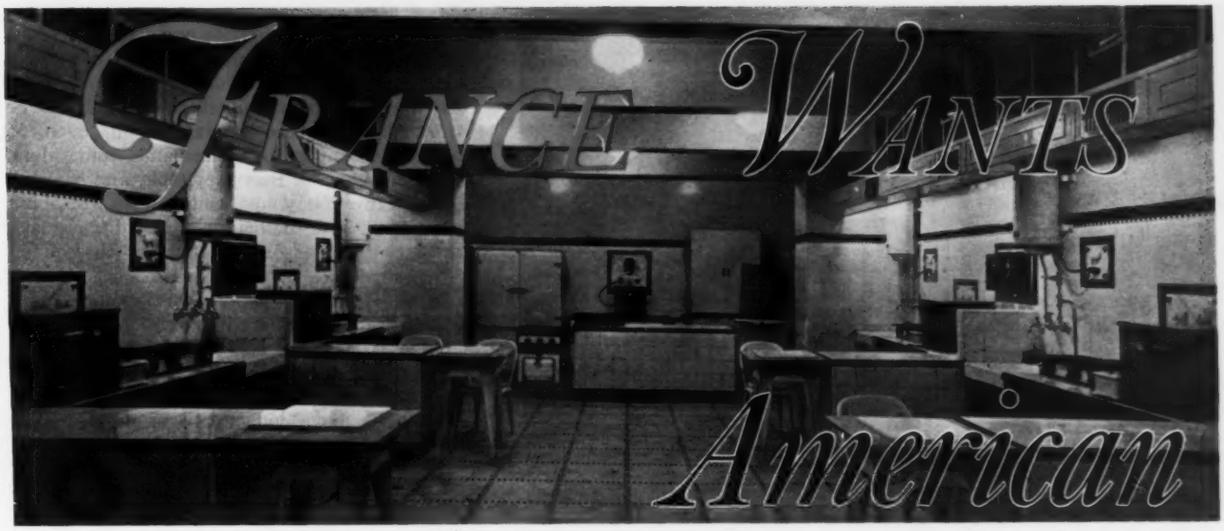
¶ In other organizations the N. A. P. A. has representation on many committees such as those of engineering societies, departments of the United States Government.

RECOGNITION of the common interests of both buyers and sellers has also brought about the sponsoring of a code of ethics which applies to both factors. This new decalog of business was officially endorsed at a joint meeting of representative executives in the manufacturing, sales, and purchasing fields, as well as economists, business journalists, and trade association leaders. It is readily being accepted by all who recognize its fairness and value.

That such cooperation with industry and government as previously indicated seems to be a dominant characteristic of the association may well be left to others for expression. But, in passing, perhaps it is permissible to cite a few of the many outside interests in which the association is represented or engaged. With the Department of Commerce, a few of these contacts include representation on: the Planning Committee; Division of Simplified Practice; the Committee on Wood Utilization; the Standing Committees on Purchase Forms, Bank Checks, Office Furniture, Plow-Bolt Industry, Iron and Steel Scrap Specifications, Paint and Varnish Brushes, Hard-Fiber Twine, etc., all of the Division of Simplified Practice.

The association is also represented on the Advisory Boards on Domestic Packing and Commodity Specifications, as well as the Consulting Committee on Lumber Standards.

In other organizations the N. A. P. A. has representation on: The Committee on Standardization of Gears of the American Society of Mechanical Engineers; the Committee on Pattern Standardization of the American Foundrymen's Association; the Committee on Form and Arrangement of Specifications of the American Standards Association; the Committee on Naval Stores of the American Society for Testing Materials, also a special committee for increasing the usefulness of the society's work. In addition, the association is represented on the Conference of Statisticians in Industry of the National Industrial Conference Board. It also works with such organizations as the National Better Business Bureau, the American Arbitration Association, and numerous other trade, semi-professional, and special associations.



Appliances

Rapidly changing economic conditions in France are creating an ever increasing demand for electrical products

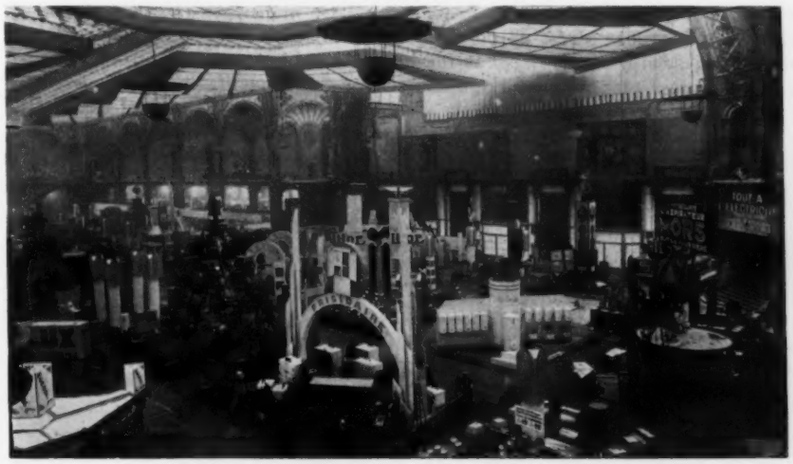
Another of a series of articles appearing in ELECTRICAL MANUFACTURING in which the author discusses conditions in foreign markets, with respect to the demand for electrical appliances and products

By DOROTHY DIGNAM
Special European Correspondent

THERE is no word for "home" in the French language, but when noontime strikes in Paris, bringing a two-hour lunch period, those hungry hordes who pour into the subway entrances, overflow the back platform of the buses, and knock you down with their impatient bicycles, know very well where they're going for that big bowl of hot soup! And no special word in their vocabulary is necessary to lead them to it!

The French, however, are very expressive about their homes and romantically use the term "foyer"—the hearth—to indicate something more than a house and lot, but probably the word we heard most often in connection with the household is "menage" and the housewife is the "menagère"—very close to our word "manager."

A Frenchwoman is always the manager of her home, no matter how many servants she may employ. An old proverb, doubtless much quoted by disgruntled husbands, goes to the effect that "the destiny of Frenchwomen is to occupy themselves with the interior." Very few Frenchwomen, alas, have devoted themselves solely to this ample undertaking. Even today they are invariably a factor in the husband's business. Papa behind the counter and Mamma behind the cashbox is considered the ideal personnel for a small business enterprise. The French woman has a positive genius for watching expenses and keeping down overhead, and even in matters of barter and trade it is usually a nudge of Mamma's plump elbow that signals to Papa to hold out for a better price.



The 1929 Salon des Arts Menagers, household exhibition at Paris, with electrical displays as far as the eye can see. In the foreground are the exhibits of an American electric refrigerator, a French appliance manufacturer, a Swedish electric water heater, and a French vacuum cleaner, while the illustration at the top of this page shows a modern public utility educational cooking laboratory in Paris

This little preface on feminine French character is most important in a consideration of the market here for any kind of household equipment. It is the woman who must be sold because it is the woman who manages the money.

Not the woman who signs the checks, of course! Papa preserves his authority to that extent, at least. But the decision to spend usually emanates from Madame. Refrigerator salesmen tell me that they can't even get a signed

The newest electrical shop in Paris. Mors is the well-known manufacturer of vacuum cleaners, but this shop also sells a general line of lamps and appliances. It is modernistic in decoration and there is a salesroom in the rear with offices on the second floor

contract from a butcher until Mrs. Vealchop herself agrees to the expenditure. If this is true in the commercial field, how much more true in selling the lady an electric refrigerator for her own domain.

There Is Prosperity in France

FRENCH women today, however, are more progressive than ever before. They stand on the eve of gaining the vote. They have entered the bar and are recognized in science and medicine. They have money to spend at last, after generations of working and scrimping and saving. And the standard of living is slowly rising, due to a period of growing prosperity. There is no vast unemployment here as in England and Germany. Every family has some income, small though it be.

And there is very evident interest in better home equipment. The sixth annual Salon des Arts Ménagers—the most important household exposition of the year in Paris—has just closed, with fully a third of the five hundred exhibitors showing gas and electric appliances. A Paris newspaper, in reporting the show, commented particularly on the electrical display, stating that there was evidently a growing interest in labor-saving devices in French homes.

But personally, I was most encouraged about the situation here when I saw the type of women attending the exhibit. You know what we get in America—mobs from the lower classes, determined sample-gatherers armed with paper shopping bags, literature hounds who leave a train of discarded circulars all the way home!

At the Paris show no samples are distributed and there is only a discreet amount of printed matter—strictly for those who stop at the booth and look interested. The aisles are traversed by women very evidently of the upper middle and professional classes—well dressed, intelligent, ready to be informed. On Saturday afternoon, even on Saturday morning, many husbands come along and one sees, too, that inevitable and international twain—the young couple who are about to set up a home of their own and discuss each exhibit with heads close together and many whispered jokes.

There is one situation in France which parallels a much deplored condition in America and that is the tendency to dress up the front part of the house and neglect the kitchen. International congresses, alas, and high-salaried commissions, have convened over problems far less weighty!

And yet there is probably more excuse for kitchen-neglect in France than there is in America because the kitchen here is almost wholly the domain of the domestic. In all the older houses and apartments, the salon or drawing room is first in richness of furnishings. Then the boudoir or bedroom is given attention, and, finally, the dining room. When you get to the kitchen it resembles nothing so much as the walled-off end of a dark hall—dingy, drab, disheartening.

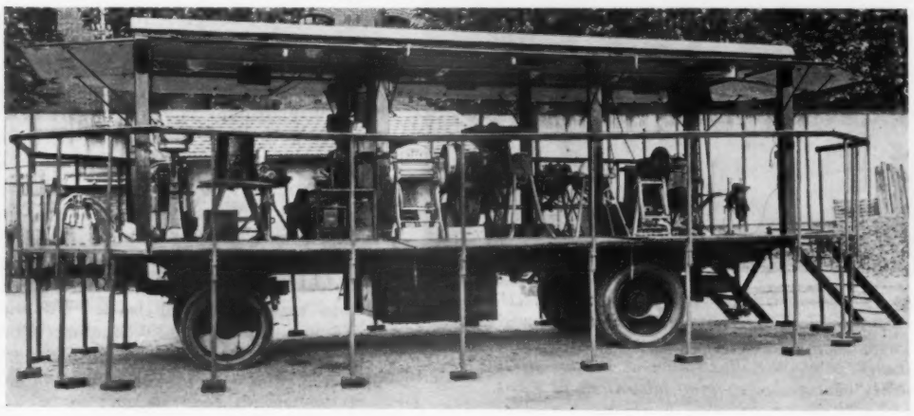
In the more recently completed buildings, one finds tile walls, built-in cabinets, more adequate lighting and a general air of cheerfulness. While in the just-going-up-apartments, the kitchens have electric refrigerators, ventilating fans, sidewall lighting fixtures, and rose and mauve color schemes such as the modernistic cuisines installed by Charles Blanc.

But the American electrical manufacturer is interested in selling to a market that doesn't have to wait for the family to fall into money and take a lease on a palatial apartment. What appliances are actually in use in France today and what will be the demand tomorrow?

Vacuum Cleaners Are in Demand

THE vacuum cleaner seems to be the most popular appliance. Actually more irons have been sold than vacuum cleaners because irons cost less than $1.50. But when you ask what appliance is most widely used and most popular, I repeat my first statement—the vacuum cleaner. The old-fashioned "bonne" of the French kitchen—usually an import from the Provinces where she wore wooden shoes for dress-up on Sunday—doesn't take to electric irons or anything else of the kind. She likes a red hot fire in the old kitchen range and two or three squatty little sad irons!

The vacuum cleaner, however, is a sort of pet in the family and not infrequently operated by the mistress herself, "since servants are so apt to be wasteful of electricity."



A TYPICAL exhibit of farm equipment is this, transported about the country by motor truck. In it are contained such devices as milkers, separators, churns, and other farm devices, which may be viewed from the platform formed by the sides of the trailer

One large French concern using Swedish patents does the outstanding business in vacuum cleaners in France, and another concern of Swedish origin has second place. Two or three American makes have some distribution in Paris, but no one of our familiar names at home has really made an impression on the market. A French-made cleaner of good reputation can be had at less than $25, but the more usual price is about $35 to $40. Cleaners with bags, as we know them in America, are sold mainly for large apartments and rooms that are all-over carpeted. For smaller homes, the "tin can cleaner" is recommended—with a metal receptacle replacing the bag—and positively the noisiest things that ever disturbed the peace!

But it is interesting, now since irons and cleaners have been timidly accepted, to consider what will be the next appliance to sell in volume. Certainly it is true that the *first* electrical appliance in the average French home isn't the *sole* appliance for very long.

An American was telling me of his experience in selling out a furnished flat in Paris. In the inventory were three American electrical appliances—an iron, a cleaner and a toaster. The new French tenants were quite indifferent to these but since they were included in the sum total, all were accepted as part of that strange American complex for electrical contrivances.

My friends were away in Germany for a year but on their return to Paris went to call on the Parisians in the old apartment.

"And you should have seen the electrical things they'd bought," I was told. "There were all the appliances we had left and three or four new ones. They even had a funny little flat thing on wheels to heat plates at the table."

Let's hope, from a manufacturing standpoint, that the more these people get the more they want!

Some authorities have told me that they think table appliances will be the next in line of acceptance in French homes. But from the preparation that dealers and manufacturers are making, it looks to me like the electric washer will be the new comer.

The household car in the Nord-Lumiere train consists of three rooms, of which this is the living-dining room. Visitors are asked to pass through the car, where demonstrators are stationed in each room to explain the uses of the various electrical products on display

French Dealers Want American Washers

ONE of the leading vacuum cleaner manufacturers is working on a washer right now and intends to use his present sales organization to follow up the homes where cleaners were sold a year ago. The United States Trade Commissioner in Paris, whose business it is to promote American industry, showed me a list of thirty-five or more French retailers of good rating who had written to the Commercial Attaché in Paris asking to be put in touch with the manufacturers of American washers.

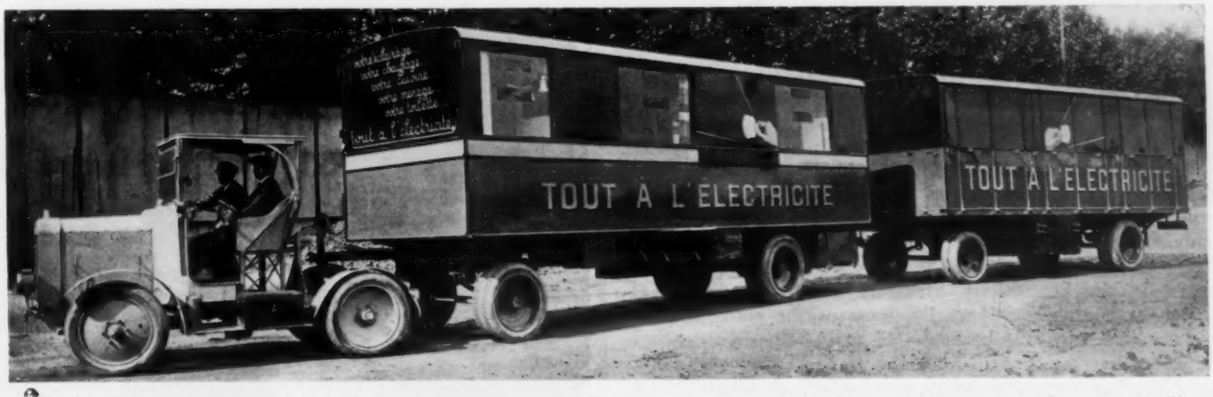
One of the biggest and most progressive of our own concerns, whose washer sales-drives are the envy and despair of the rest of the industry, is reported to be hovering over Paris, even now. The Trade Commissioner knew of at least four standard American makes that are obtainable in France.

Ironers and Driers Needed in France

IN the meantime, this is not only a washer-less country—it hasn't even a washboard! The laundresses use a small rubbing contrivance over their knuckles and in the country they use the stones at the brook-side. A French friend of mine who married an American and lived in Chicago for several years brought back with her a small hand-bowl-washboard for doing up gloves and stockings. It is a great curiosity among her French friends!

But this general lack of laundry equipment doesn't mean that it's going to be easy to sell electric washers in Paris. In homes where purchasing power would warrant the expenditure it has never been the custom to do any laundry work at home. Everything is sent out to the little neighborhood cottage laundry where the work is expert and the prices reasonable. And in city apartments, where most of the population dwells, there is literally no place to put a

(*Continued on page 70*)



The electric demonstration train of Nord-Lumiere, which travels through the provinces to further the electrical education of the French people. The first car is the household section, while the second trailer contains farm equipment, as is shown in the illustration on the page at the left. "Everything by Electricity" is a liberal translation of the legend on the sides of the trailers

A.L.E.A. Refix Is Winning Out

Association

To increase the sale of fixtures, and more particularly to encourage the replacement of old fixtures with new, the Artistic Lighting Equipment Association started a campaign more than a year ago, which has been so highly successful that it is still being carried on. Part of this success might be accredited to careful planning, but most of it is due to the intensive interest in the campaign

TRULY remarkable results have been achieved by the Artistic Lighting Equipment Association in the promotion of a nation-wide sales-building and refixturing campaign, that has now been in operation well over a year. Launched, as it was, at the annual meeting and convention of the association in Cleveland, Jan. 25-28, 1928, action was immediately taken to arouse the interest of every member—dealer, jobber and manufacturer of lighting equipment in the country.

So great was the response and so enthusiastic was the interest of the members that the offices of the association were literally swamped with demands for the sales-promotional literature that had been prepared as the nucleus upon which the campaign was based. Numerous too, were the requests from non-members for this literature, showing that they were also interested to the extent that they were willing to cooperate with the association.

The Eyes of Your Home
And the jewels of your room —artistic lighting equipment. Redecorate with new and charming fixtures. The old ones can be replaced with new ones of modern design, without muss or dirt in a few minutes' time. New fixtures transform your home, add fresh charm to every room—and the cost is moderate. For suggestions or estimates call at the showrooms or telephone.
YOUR NAME HERE
Change Your Lighting Equipment

This promotional program was designed primarily to produce greater consideration of all kinds of lighting equipment, from the standpoint of artistic merit, quality, design and finish, and to awaken in the minds of the trade and the general public a more definite consciousness of what really constitutes good lighting equipment, in order that everyone might easily understand those differences in value that make for differences in price.

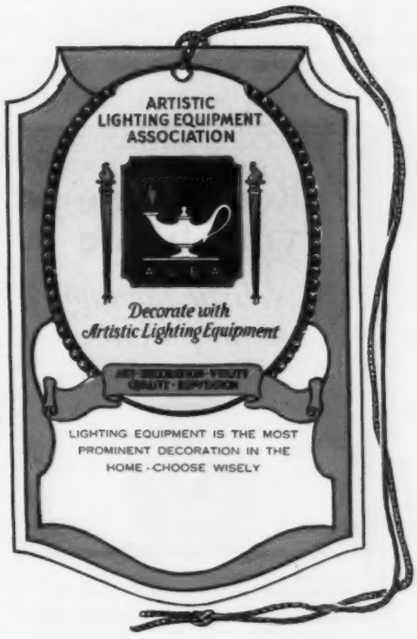
Primarily, the entire campaign was conducted through the extensive use of nation-wide constructive advertising, directed to both the lighting industry and the public as a whole. This advertising program and the literature was so well planned that it was bound to create interest in lighting equipment. Yet, the full measure of success so far achieved cannot be wholly accredited to advertising alone, but rather, in large degree, some share must be given to the spirit with which the members of the association entered into the promotional work, and to the whole-hearted, intensive manner in which the association as a whole cooperated in furthering the purpose of the campaign.

The spirit of the members is exemplified by the fact that there is still a steady demand for more and more of the advertising literature, while the cooperative effort of the association is shown by the fact that no expense was spared to make the promotional literature the best and most attractive obtainable. Generally, most of the entire expense of the campaign was borne by the association, with the exception that some small amounts of literature, engravings and the like were distributed to members at actual cost to the association. Of course, members were required to pay for individual advertising space in local newspapers, while the association paid all of the costs of such advertising as was carried in business papers and other magazines.

As announced by G. P. Rogers, managing director of the association, at the time the campaign was launched, it embraced all the factors in the lighting equipment industry, and was planned in eleven successive steps, arranged in the order in which each was to be undertaken by the association, and carried out by each particular group.

turing Campaign Through Intensive Cooperation

Any campaign intended to arouse the public's interest must be well advertised, and if it is to be noticed the advertising must be attractive. Such was the thought behind the planning of the A. L. E. A. refixturing campaign, with the result that an extensive assortment of literature, posters, cards and labels were used, most of them being in color


ARTISTIC LIGHTING EQUIPMENT ASSOCIATION
Decorate with Artistic Lighting Equipment
LIGHTING EQUIPMENT IS THE MOST PROMINENT DECORATION IN THE HOME - CHOOSE WISELY

In the foreword of an elaborately illustrated thirty-two page booklet describing the various steps of the campaign it is explained that the campaign was planned to guide the sales promotion and efforts furthering refixturing, developed for the exclusive use of the lighting equipment industry. The program, as outlined in the booklet, was endorsed and approved by the board of directors.

Designed to increase sales volume if carried out by every member of the association, the eleven steps in the campaign were essentialy as follows:

Step Number One—Use of Emblem and Slogan: All members were urged to use the emblem and slogan of the association, "Decorate with Artistic Lighting Equipment," on all their printed matter, and to display prominently in their places of business the membership emblem, which is provided in three forms, for manufacturers, distributors and dealers. The object of this step was to popularize the slogan and emblems so that the public and the trade would want lighting equipment bearing these designations. "Change Your Lighting Equipment" was also suggested as a slogan for members.

The association prepared a variety of emblem and slogan electrotypes which were available to members upon request, at no charge.

Step Number Two — Use of Sticker Label: The association had an ample supply of sticker labels, showing the emblem above these words: "This material is being purchased for use by a member of the Artistic Lighting Equipment Association." All members were urged to use these stickers on all purchase orders, letters, or requests for price estimates on merchandise to be purchased by them. The object was to enhance the value of the emblem, encourage reciprocity and trade, and develop a greater consideration for the individual concern by those from whom merchandise and supplies were purchased. The use of the sticker was advocated as an indication that its user was a progressive concern which contributed to the advancement of the industry through cooperative effort as a member of the association. Stickers were furnished free and were printed in the two colors of the association—orange and black.

Step Number Three—Use of String Tag: To authorized manufacturers a string tag was furnished at cost. It bore the emblem on a red, gold and black flap, under which was this inscription: "This tag indicates that this merchandise was made by a member of the Artistic Lighting Equipment Association and is your guarantee." Below the flap is this message: "Look for this emblem of dependability when buying lighting equipment. It is a guarantee of good merchandise at a fair price." The reverse side of the tag bore lines for the number of the order represented by the merchandise, its finish and price.

Manufacturer members were instructed to attach this tag to those of their products on which its use is licensed by the association. Dealers were to retain the tags on the products and push all lines carrying them, tying them into their advertising and selling and other sales promotional material furnished by the association.

Use of the tag, it was explained, was to keep the emblem before the public as a mark of dependability and good mer-

chandise at a fair price. Advertising to be placed both by the association and its members was to request the public to look for the tag before buying lighting equipment. The design was intended to create a special market for products bearing the tag so that dealers as well as manufacturers might profit from selling such merchandise. The tag also strengthened the association's influence and gave the dealer a selling argument based on quality rather than price.

Step Number Four—Advertising the Emblem Tag: From time to time the association published advertisements in the business press to show the dealer, jobber, architect and builder the desirability of handling lines bearing this tag. Later it was planned to publish advertisements in national magazines on refixturing and replacement, and in these advertisements the public's attention was to be called to the meaning of the tag and emblem. The design, of course, was to establish an acceptance for merchandise so labeled.

Members were expected to tie in their own advertising with the association's advertising by indicating that they produced or sold lighting equipment bearing the mark of dependability and fair dealing. The association began its advertising campaign as soon as the progress of the program permitted. The booklet describing the campaign included several examples of the advertising that was to be used.

Step Number Five—Direct Mail and Local Refixturing Advertising Campaign for Dealers: This was designed to help dealers secure refixturing and replacement business and to obtain lighting contracts for new houses, stores and factories. The folder on this campaign contained full instructions, sample letters and layouts for local newspaper advertisements. The folder and mats of the advertisements were obtainable from the association.

Step Number Six: Advertisements and special stories on lighting equipment for use in local newspapers were supplied by the association free to manufacturers, jobbers, dealers and central stations selling lighting equipment. This service was designed to sell the refixturing idea to housewives whose lighting equipment was out of date.

Step Number Seven—Mailing Folders: The association had prepared mailing folders and furnished them at cost. They were designed to increase replacement business and were entitled, "Selecting Lighting Equipment Appropriate for the Home." The copy enlarged upon the fact that new lighting equipment of modern and artistic design would improve the appearance of a home more than anything that the customer could buy for an equal amount of money. They informed the recipient that he incurred no obligation by asking the dealer to submit an estimate on lighting equipment suitable for his home. Each folder had space for the dealer's imprint and for illustrations and brief descriptions and prices of his lines.

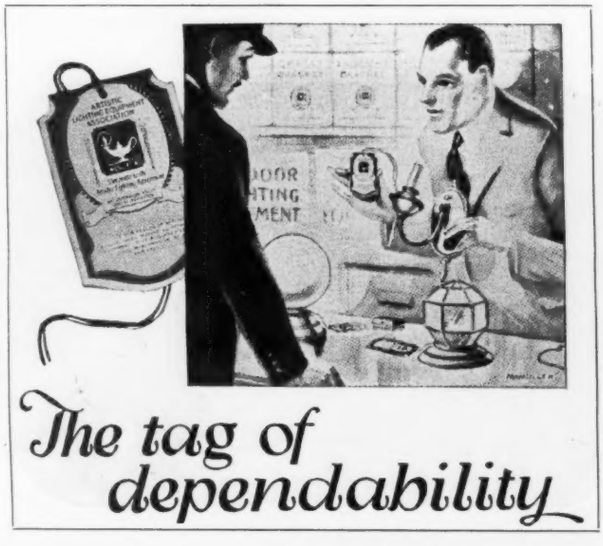
Step Number Eight—Dealers' and Distributors' Membership Emblem Signs: The association furnished these signs to all manufacturer, dealer and distributor members. The prominent display of these signs were intended to tie the concern in with the promotional work of the association and promote the campaign.

Step Number Nine—The association offered at cost five window or store display cards. These were beautifully decorated, to the end that they made very attractive displays. The story told by these display cards was a direct tie-in with Step No. 3, which had to do with the use of tags on lighting equipment that carried the Association's emblem, and the posters were intended to further convince the buying public that the emblem meant a square deal and that such dealers as carried lighting equipment so labeled were progressive merchants handling desirable lines of goods.

Step Number Ten—Extension Lighting and Lantern Booklet: Members were urged to distribute this to prospects and customers. It was very artistically arranged with the intention of pointing out the advantages to be obtained from the use of decorative lights other than in the home. In this respect the booklet showed how lights could be used for protection at night, for the illumination of gardens and for lighting entry-ways to gates, doors and even garages.

THESE illustrations are reproductions of some of the advertising literature used by the A. L. E. A. in its refixturing campaign. Most of the printed matter was in the two colors of the association, orange and black, except posters and window cards. All of the literature was distributed to fixture dealers, jobbers and manufacturers

Step Number Eleven — Members were also urged to submit to the A. L. E. A. all articles which would increase sales. There were thirty-one selected subjects about which the members of the association were requested to write, although any member was at liberty to send in any kind of story. Any of these articles of merit that were submitted were prepared for release to a selected group of magazines and newspapers where it was thought they would do the most good. Many of these news releases were very helpful in bringing about a consideration of what constituted good lighting equipment, both from the utilitarian, artistic and decorative standpoints, and awakened in the minds of the trade and public a realization of the differences in price and quality in lighting equipment.



$6,340 SAVED Yearly by Reclaiming *Oil Waste*

An electrical manufacturer uses four domestic clothes washers to wash out oily rags and cloths used throughout the plant. Only one attendant is needed to keep the machines running and make a large saving possible

THE Syracuse Washing Machine Corporation, Syracuse, N. Y., effects a yearly saving of over $6,000 by the use of its own product in washing soiled wiping cloths, towels, etc., that are used in its factory.

Prior to the installation of their present washing system, this company discarded all wiping cloths as soon as they were soiled. They used an average of eight bales of cloths a month, average weight about 700 lb. each. At a cost of 14 to 15 cents a pound, this represented a yearly expenditure of about $9,700. Now this rag consumption has dropped to an average of 2½ bales per month, or a yearly cost of about $3,000. Special checkups have proved that many of these rags, ordinary cheap "wipers," have been reused and rewashed 16 times. Better grade rags have been washed as high as 40 times.

Washroom towels, hospital uniforms, etc., previously were sent to a commerical laundry at an average yearly cost of $1,050. These pieces are also laundered in the factory now. The total saving ($1,050 on laundry work plus $6,700 on rags) is $7,750 yearly. The total washing cost included depreciation on washing machines, salary of workman, gas and floor space, $1,410. This leaves a net saving of $6,340.

Clean wiping cloths are issued every morning from the tool room to the foreman of each factory department, upon return of soiled cloths that were in use the day before. The foremen distribute clean cloths to their workmen as needed and receive soiled cloths in return. The janitor also picks up soiled cloths as he makes his nightly rounds and turns them in for washing.

The rags, carrying every conceivable kind of soil, are turned over to the laundry room. Some are soaked with machine oil, others are caked with cleaning compounds. The man in charge of washing separates the less soiled pieces from the extremely dirty ones. The cloths in the first classification are washed once, but a change of water is necessary to completely clean badly soiled rags and they are put through two washings.

Each of the four washers handles an average daily wash of six loads of cloths. (A "load" represents about 10 lb. of dry cloths.) Most of the loads have to be washed twice, due to their extremely dirty condition, so one day's work usually represents about eleven separate washings for each machine, or forty-four washings in all. From twenty-five to thirty-five minutes is given for each washing, depending upon the condition of the cloths. Each washer is in active operation for five and one-half to six hours each day.

The centrifugal drying tub that is part of the washer is used to extract the water from the cloths preparatory to "hanging on the line." Rinsing is also performed in the dryer without removing the cloths.

When the surplus water has been extracted by the drying tub and the cloths are evenly damp (a matter of a few minutes) they are removed from the drying tub and hung on wires, strung on steel racks. For the final drying, preparatory to re-use of the rags, these racks are rolled into baking ovens (obsolete gas ovens formerly used for japanning work) and the cloths are subjected to a heat of 240 to 260 degrees Fahr. for about 30 minutes.

The factory manager believes there are advantages in this factory laundry process over and above the economy of using the same rags many times. Better rags can be used when there is an opportunity for salvage. These rags are more pleasant to use and workmen are enabled to keep themselves and their machines in better condition.

FOUR clothes washers, two obsolete japanning ovens, two drying racks, and one set of laundry trays comprise the equipment in the laundry room. They represent a total investment of $840. A regular clothes drying oven may be used if no obsolete equipment is available. A good oven of the type and size needed for the same volume of rags that is washed in this plant can be secured for $125 to $200

If You Are Planning to Make

Airplane Lighting

The location and size of lighting units are important factors. Tests have shown that the landing lights located on the wing tips may decrease the speed of a plane as much as six or seven miles an hour

The greater speeds and hazards of aviation make the designing of landing lights a difficult problem. Very much higher orders of intensity and quantity of light than those required under the extreme conditions of automotive service are needed to make flying safe

BY

L. E. LIGHTON

Electric Storage Battery Company

AND

W. M. JOHNSON*

National Lamp Works of General Electric Co.

AS the number of night flying hours increases, the necessity for proper lighting facilities becomes more acute. This applies not only to the lighting of airports and airways but also to the lighting of the airplanes themselves since these respective facilities are somewhat dependent upon each other.

From figures published by the Department of Commerce, it has been estimated that only about half of our regularly used airways are lighted for night flying, and a very small percentage of our airports are equipped with lighting facilities for night landings. This indicates a necessity for planes being provided with lighting equipment for scheduled night flying as well as for emergency landings.

In addition to the high intensity lighting needed for following unlighted routes and for landing in unlighted fields, night flying planes also require navigation lights and illumination of the instruments and the cabin. To fulfill each of these lighting requirements in a most efficient and economical manner, some immediate study and direction should be given to each phase of the problem before diversity of opinion and habit set precedents which may become difficult to standardize.

The entire problem of airplane lighting resolves itself into three logical divisions:

1—Illumination requirements

2—Lighting equipment

3—Energy supply and distribution

Illumination Requirements—The Department of Commerce has already specified certain requirements to be met—for example, navigation lights must be visible at a certain distance and through certain angles. While the Department also requires electric landing lights on commercial passenger planes when flying at night, no specifications as to illumination are given. Neither, to the writer's knowledge, are instrument lights or cabin lights required, although these are already being installed on many planes.

The problem of illuminating the cabin properly is analogous to motorcoach lighting and will perhaps in practice resolve itself to a minimum requirement of so many watts per seated passenger. Instrument lighting, however, presents a somewhat different problem from that encountered in automotive service; most pilots want only just enough light on the instruments to permit reading them in order to minimize interference with vision outside the plane.

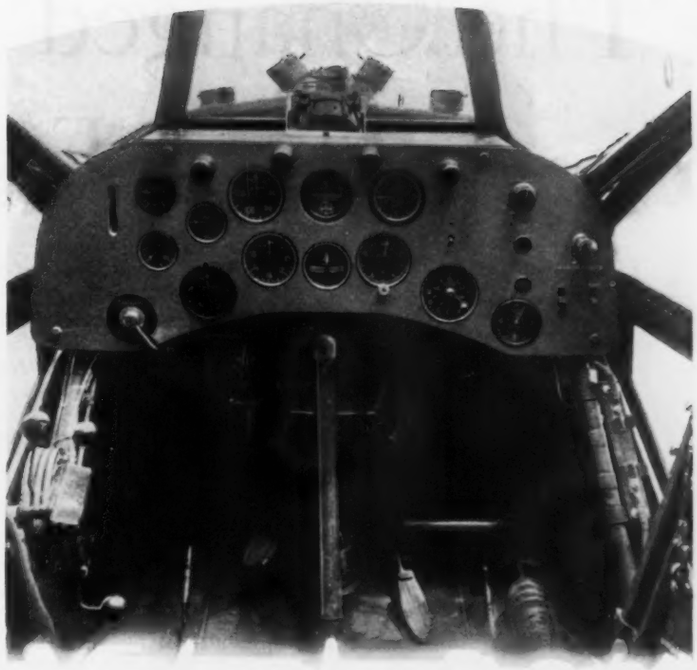
Landing lights present the most difficult lighting problem. The greater speeds and hazards make necessary very much higher orders of intensity and quantity of light than those required even under extreme conditions of automotive service. Yet the limitations on electrical equipment, as regards both weight and space, are more stringent than in any other service.

The opinions of pilots vary as to the quantity and distribution of light which should be supplied for landing purposes. Some desire a concentrated beam alone, while others would have this supplemented by a wider beam spread for close-range service. However, there seems to be considerable unanimity of opinion that the long-range concen-

* From a paper presented before the Society of Automotive Engineers.

Equipment

These pointers will assist you in designing it



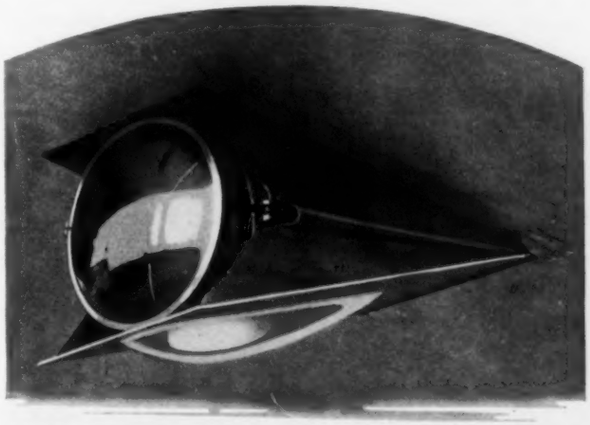
Most pilots want only enough light on the instruments to permit reading them and minimize interference with outside vision. The illustration above shows the instrument board in Colonel Lindbergh's Mahoney-Ryan monoplane. Furnished by courtesy of the Pioneer Instrument Company

trated beam is desirable for following railroads, highways, and natural landmarks along unlighted routes on dark nights. Therefore, at least one unit should be provided for this purpose, preferably one which can be directed at will by the pilot.

For landing and searchlight service the quantity of light—that is, the size of lamp and the energy required—depends to a considerable extent upon the distribution of light from the units. As yet no tests have been made to determine what distribution of light is required, and until actual data are available no definite decison can be made on the proper lamp for this service.

Lighting Equipment—After investigations have shown the quantity and distribution of light required, the equipment designer will be faced with many problems—first, there will be the problem of location of the units so as to give best vision for the pilot, least wind resistance, minimum vibration of the unit, and minimum energy losses and weight in the electrical system; second, there will be the mechanical construction of the units themselves with respect to minimum weight, accessibility, and adequate protection from the elements.

Maximum visibility for the pilot is obtained, in general, by locating the units as far from the line of vision as is practicable, and by preventing the light from striking polished surfaces of the plane—especially the propeller. The location and size of the units are important factors; tests have shown that the landing lights located on the wing tips may decrease the speed of the plane as much as six or seven miles per hour. Lighting equipment that can be inserted completely within the wing or folded within the wing when not in use will be of great value. This is an easy problem on the thick wing monoplane, but a hard one on the thinner wing of the biplane. While the unit itself can be designed to withstand the vibration encountered, the service life of the lamp is greatly shortened by excessive vibration.



Lighting equipment that can be inserted completely within the wing or folded into the wing when not in use will be valuable

Energy Supply and Distribution—The present trend seems to be toward a 12-volt system, and from the lighting standpoint this is perhaps the best compromise. Generally speaking, a 6-volt lamp will more readily withstand the vibration inherent in airplane service, but this advantage is offset somewhat by the lower energy losses (resulting from the lower current) in the 12-volt system. In the final analysis, the regulation of voltage at the lamp socket is of greater importance than the particular voltage used. It should be remembered that the light emitted by an incandescent lamp varies as the 3.5 power of the voltage. With a battery system only, there is a considerable variation in voltage as loads of various wattages are switched on. Likewise in a battery-generator system voltage variations are introduced whenever the generator cuts in and out of the circuit, and it is desirable to design the layout of the electrical equipment so that these variations will be reduced to a minimum at the socket.

There seems to be no set standard on the use of generator equipment in connection with the storage battery for lighting the airplane. A rough estimate indicates that about 40 to 50 per cent of the planes used in commercial night flying are generator-equipped. Without the generator, the present standard battery equipment (a 65 ampere-hour bat-

(*Continued on page 70*)

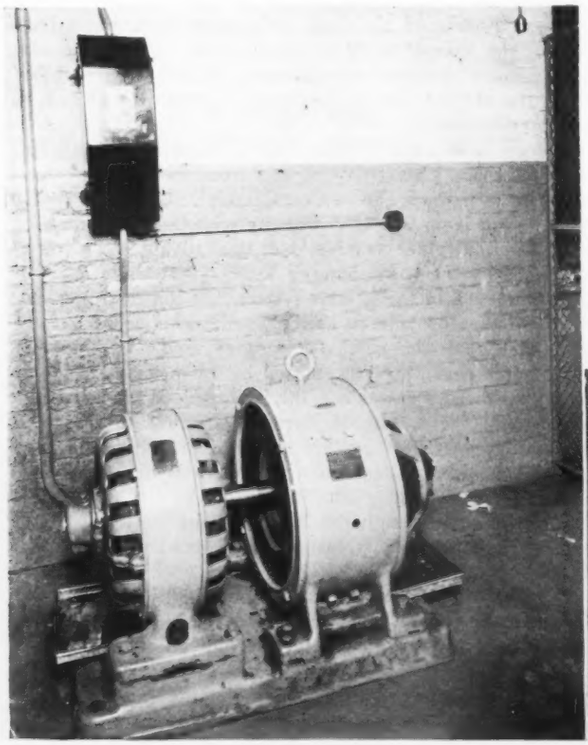
The Changed Viewpoint in Buying Equipment

There is an ever increasing tendency on the part of the consumer to purchase more and more equipment entirely on the recommendation of its maker

By G. O. Wilms
Chief Engineer, Allen-Bradley Company

WHEN you buy an automobile you don't at the same time lay in a supply of spare parts for expectant replacement purposes. Rather, you purchase a car with the expectancy and reasonable assurance that you are going to get a certain minimum number of miles of uninterrupted satisfactory service. And you don't consider it profitable of late years to put much additional investment into it when it begins to need repairs.

Perhaps this willingness to discard an automobile before its entire life has been lived is somewhat responsible for a similar attitude toward equipment in a manufacturing plant. There is, of course, the difference that pride, style and so on are influences in automobile purchase, whereas output and cost of production are the chief features in the case of factory equipment. But still, it may be that the point of view toward automobile purchase and expectancy of service may not be without its effect in developing a point of view toward all sorts of equipment.



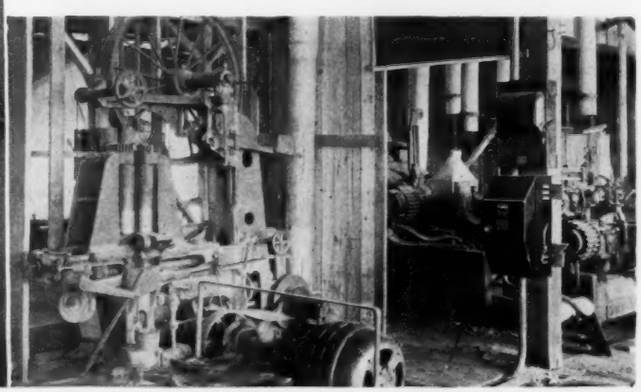
At any rate the fact remains that this attitude has taken root. That it has done so augurs well for users as a whole although it shoulders an ever growing responsibility upon the manufacturer of a particular piece of equipment. Now, to be more specific, and to see how it works out in a particular case, let us consider control devices used in electrical equipment, because it is with this line of apparatus that I am most familiar.

First let us go back to that opening sentence about the buying a supply of spare parts with a new automobile. That is just what used to happen—and only a few years ago at that—when a man bought electric control apparatus. He not only bought a supply of spare parts but he fully expected to use them. That is rather significant because it connotes that he expected the apparatus to fail from time to time. He took it for granted that it would.

Note the change today. The purchaser feels certain when he buys of a reputable concern a more or less standard piece of control equipment that into it has been built a certain assured number of operations. He has come to have confidence that this is so and furthermore, thanks to the development in this class of equipment, he is quite right in assuming this.

And when the life which is designed and built into the equipment has run its course it is coming to be accepted

INDUSTRIAL control apparatus is one type of electrical equipment that many users are buying from recommendations of its makers, and instead of attempting to make extensive repairs to the apparatus, many users are discarding it after it becomes in need of more than ordinary repairs or adjustments. In the two illustrations below are typical examples of installations of industrial controls



that the whole unit will be replaced just as in the case of an automobile.

To all of us in the electrical industry this attitude of mind amounts to nothing less than a challenge to us to live up to this viewpoint. It means that we must so design and manufacture the product that it will justify this expectation, and incidentally it has the advantage that it removes the penalty on progress which exists where large stocks of parts for old models must ever be kept on hand.

Some of the Changes in Buying

AND with it all has come the general readiness to scrap machinery whenever the new model will reflect enough larger service or output to make such action profitable. After all, it is this willingness which has put America industrially where it is today. At first this attitude made itself felt almost entirely in connection with straight line production machinery. This was perhaps natural because here it was easier to measure tangible savings. Now the effect is being felt in all kinds of auxiliary equipment. The quickened "tempo" of business is having its effect all along the line.

There is another change which has been going on all about us—a change which has perhaps come about from this new attitude toward the more intense serviceability of equipment. I refer to a greater open-mindedness on the part of the user toward relatively untried apparatus, provided that it claims to accomplish a new cost-cutting result and provided it is put out by a concern having a good reputation.

If a concern has established itself as responsible, users of new equipment which it designs and produces will take its word for it and accept it on faith. Consider what a help this is to progress as against the slow pace that is bound to result if everyone is waiting for the other fellow to be first to "experiment" with a new design of equipment.

Today whatever recommendation a concern with a good reputation makes is pretty likely to be accepted so long as that recommendation embodies a new thought that will save money. In other words, there must always be the twin qualifications that it is new and that it will show a saving. Merely that it is new is not sufficient.

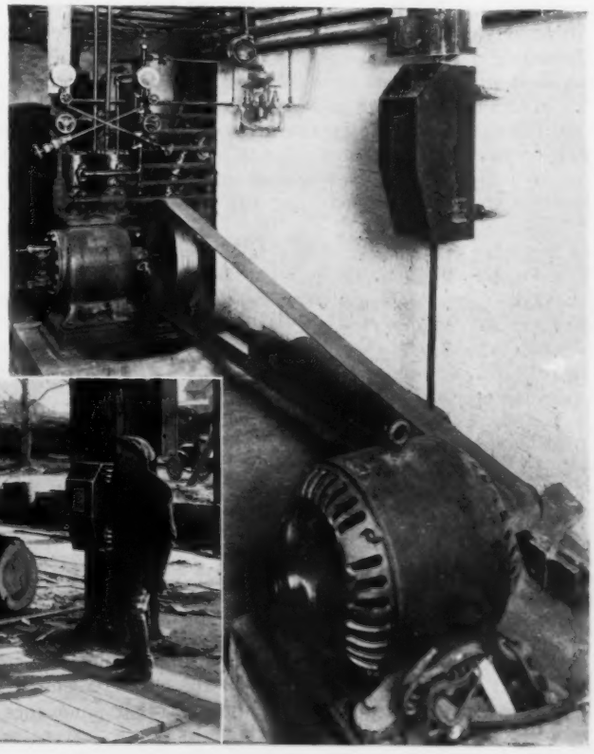
Here again is set up a responsibility that must be shouldered by the maker of equipment. The product must live up to the accomplishment claims made for it.

Another change which it seems has come about is of particular interest and concern to all of us in the electrical industry. I refer to the fact that people are now paying much more attention than formerly to installation cost. A few years ago a buyer was satisfied if apparatus worked after it was put in. Now this part of it he takes for granted and the importance of installation costs therefore looms larger than it formerly did. So we must make our designs with this ever in mind.

Business today is more of a two-dimensional affair than it was before. It is not simply linear. In our endeavor to keep pace with this new "tempo" in business there are a number of dangers present. We must be absolutely sure, for instance, that we don't claim too much for a new device.

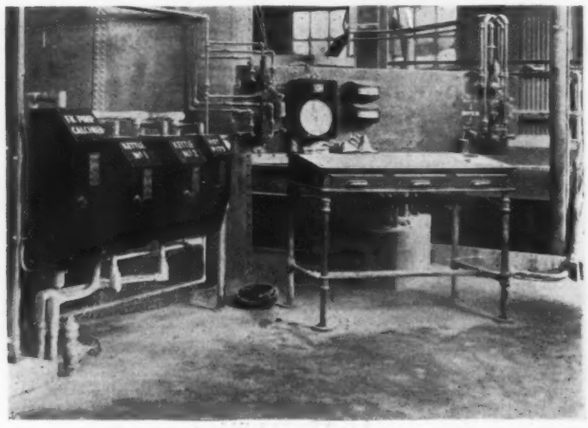
G. O. Wilms

LIKE the users of automobiles today who find it more profitable to replace old cars with new, rather than have them rebuilt or undergo heavy repairs, many industrial plants find it much cheaper to replace old apparatus with new, rather than rebuild it. In doing so they eliminate the necessity for carrying in stock extensive inventories of repair parts for such equipment as is shown below



And the competitive pressure we all feel must not be allowed to force us into unsound things.

Cost of manufacturing is an ever-present factor. Just so much can be done for a dollar. Therefore prices obtainable are an element that can get on an unsound basis very quickly unless there is intelligent guarding against it. Any downward trend should be gradual and not in such generous jumps as will jeopardize the very business itself. Prices, for instance, should never go down so fast that the manufacturer is not enabled to set aside sufficient money for research. If this happens, the consumer will have to



Here is a battery of industrial control equipment as it is installed in the plant of the Atlantic Gypsum Products Company at Portsmouth, N. H. Notice the recording instruments on the table at the right

pay the ultimate bill by paying for equipment that could have been improved upon.

There is another set of conditions which have changed before our very eyes during the last few years. And this, too, is a change that affects all of us, both as makers and users of auxiliary factory equipment. With the advent of more expensive special production machines and with the quickened pace where every minute of lost production is increasingly important, overload devices on machines are becoming a very real necessity.

Most manufacturers have come to look upon such devices as a sort of insurance policy. They are similar to insurance in that you don't necessarily expect to break an arm nor do you feel that you must break one to get your money's worth. They differ from insurance, however, in that they prevent trouble rather than partially alleviate the results of trouble.

But anyway you look at it, people are becoming increasingly willing to spend money for protection not only against damage to expensive equipment but against loss of customer good will. Often it isn't the cost of replacing burned out motors that buyers of overload equipment want protection against. It may well be the loss of good will for the resale manufacturer that causes the worry.

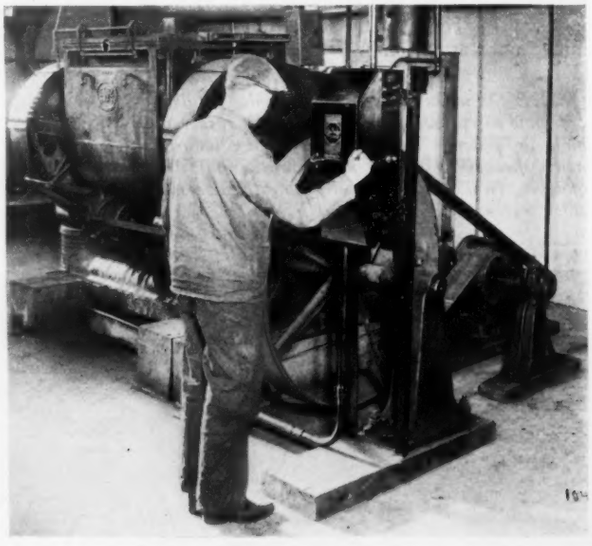
Take an example that happens to come to mind. I know of a butcher in a small Wisconsin town who installed some electric refrigerating equipment. It happened to be the first piece of this sort of equipment in the town. The motor was not adequately protected and it burned out. It merely meant a new motor and the cost of this alone did not represent a serious loss, but the good will that went when that motor burned out will be a long time in being retrieved. For word of mouth testimony of shortcomings, particularly in a small town, travels fast and far.

Consider a motor driven machine tool in a manufacturing plant. If it happens that the fuses are blown frequently owing to certain peculiarities of the load, that annoyance soon causes that particular machine to get a bad name around the plant. It would have cost but a few dollars additional for adequate modern control equipment—probably a very small proportion of the total cost of the machine—and the maker's good name would have been preserved along with the elimination of the annoyance on the part of the user.

It is rapidly coming to be not a matter of preference but of pressure. Overload devices and a better grade of electrical control equipment in general are being demanded today. And the user both expects and is willing to pay for more protection than was the case yesterday.

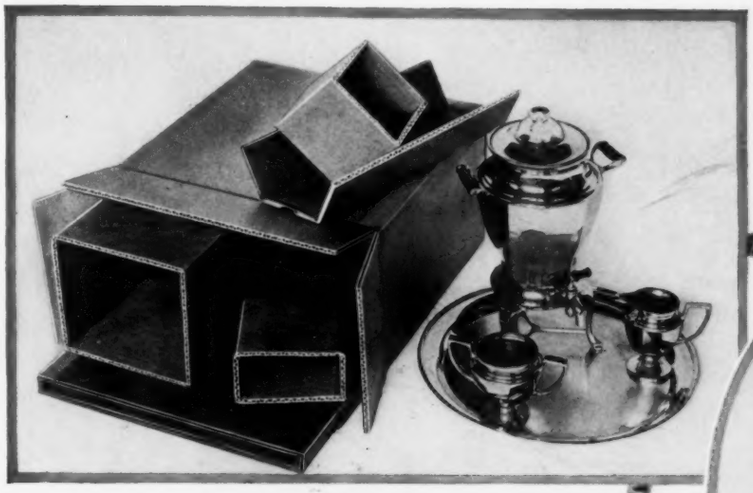
But even though education has gone a good distance in this direction it has by no means gone the whole way. To make my point specific take an example which comes to mind of a reversing switch on a tapping and pipe-threading machine. The switch may function faultlessly a thousand times a day for six months—and then the switch may weld and the motor won't stop. Wrecked dies, work or motor—or all three, may result. It would have been perfectly simple to have guarded against that very contingency by putting another switch ahead of the one they did have. But it often takes a wreck to teach such lessons. And oftentimes the teaching comes high.

There are many other instances of a similar nature that could be pointed out to show the effect on the users mind of the failures of mechanical devices. But, it all goes to show that no matter how well the manufacturer is known, or how well he constructs his different products there is always that possibility of failure. These can in no measure be always attributed directly to defects in the devices. There are many instances in which the manner of installation plays an important part. There is also the possibility that the device is not being used for the purpose for which it was intended, to say the least about the possibility of well-known cases of excessive abuse. No manufacturer can hope to overcome these conditions. The best he can do is to truthfully specify the purpose for which his product is best fitted, how it should be installed and any precautions against its abuse that he feels will cause it to fail. Once that is done the operation of the product is entirely in the hands of its user, and should it fail for some reason or other, before he blames the manufacturer he should first investigate conditions to determine wherein and why the device failed to function properly. By this means the manufacturer can continue to improve his product.

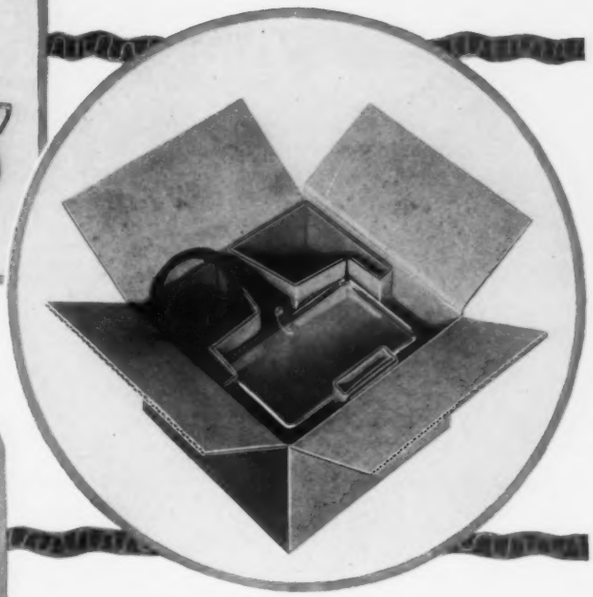


Every type of motor driven machine lends itself to the use of industrial control in some of its forms. In the illustration above the operator is manipulating a controller attached to a bread-mixing machine

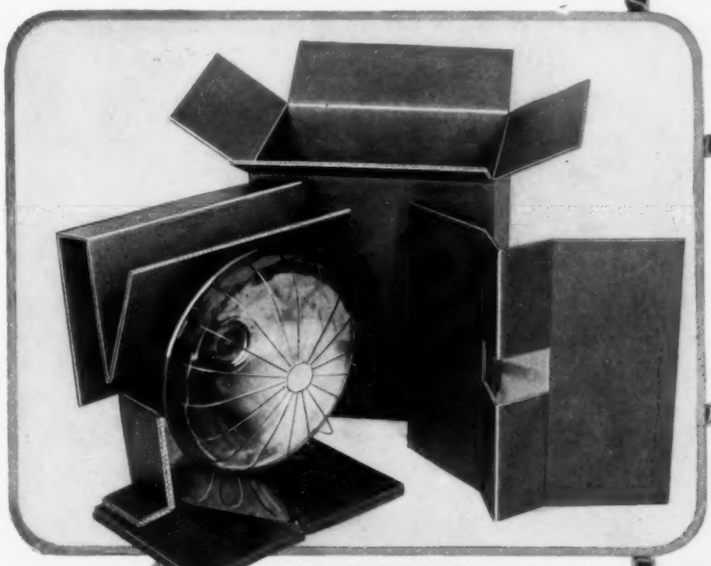
Containers for Electrical Products

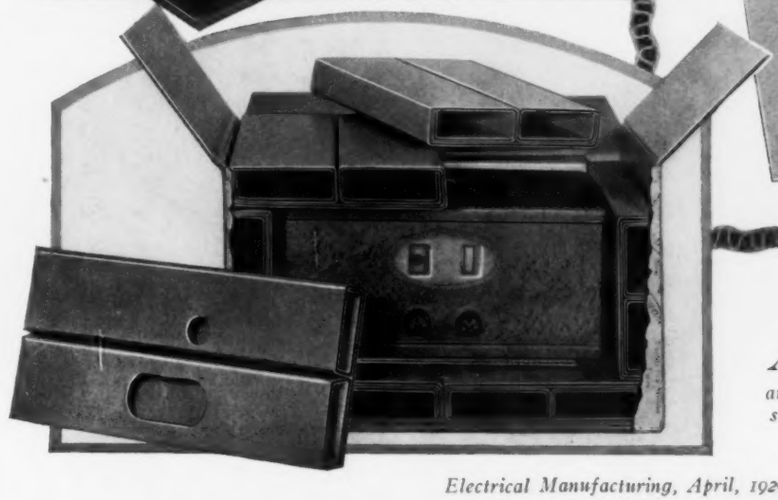


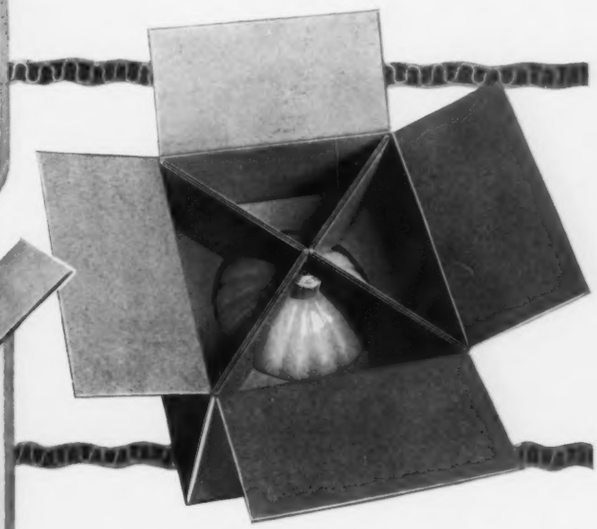
THE illustrations on these four pages were obtained through the courtesy of Robert Gair Co., Hinde & Dauch Paper Co., and the Container Corp. of America



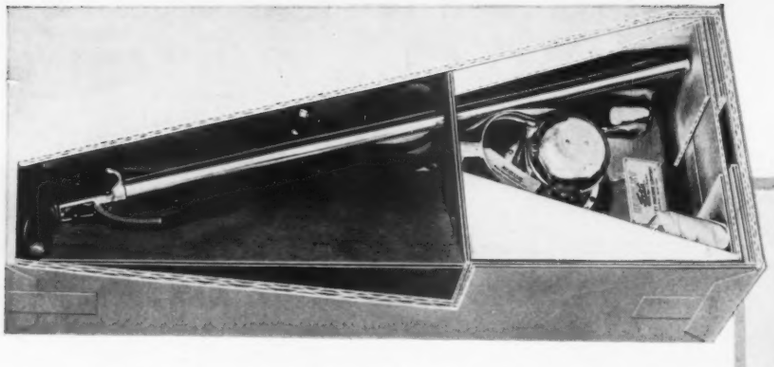
SOME extremely difficult problems are encountered in the designing of shipping containers for electrical products, as may be seen from the manner in which percolators, irons and heaters are packed



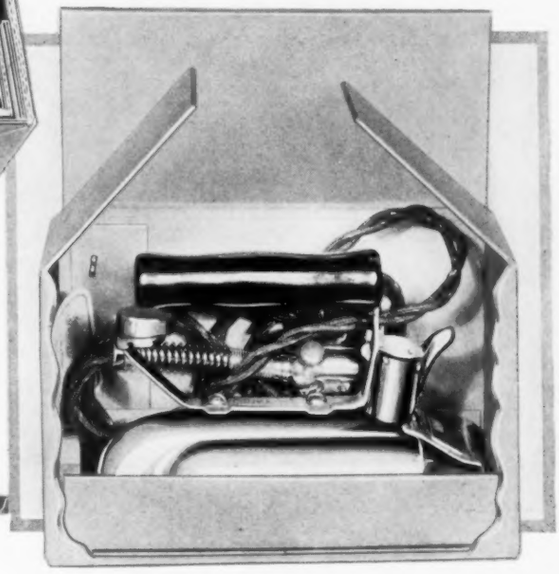




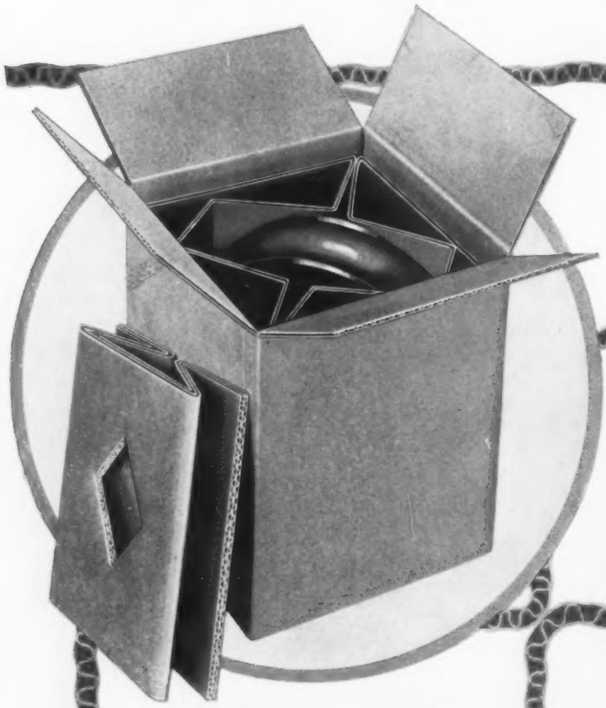
AT the left is a very complicated corrugated container for a radio receiving set. Notice how it is amply protected from jar and shock by the members surrounding the receiver in the container. Above is the method of packing a reflector



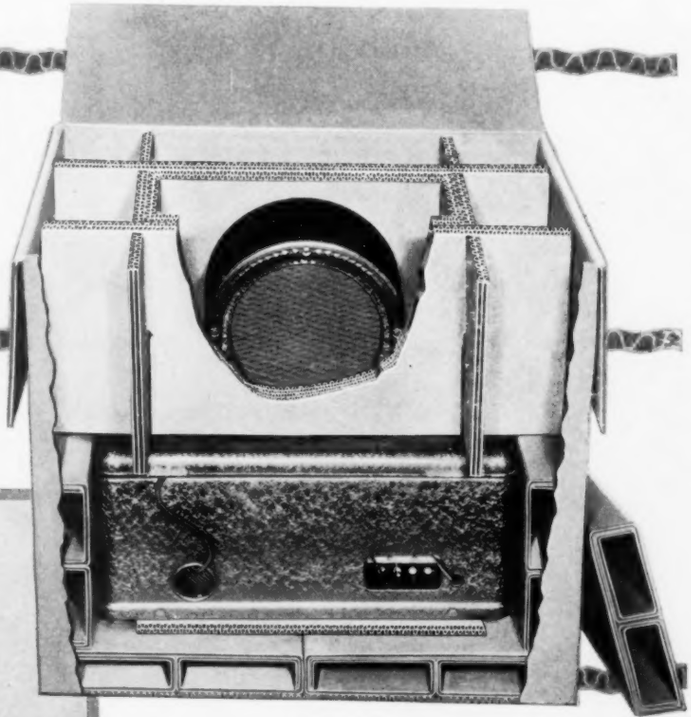
IN the construction of the container for the electric iron below, note that it is made of but two pieces, so designed that one containing the iron slips directly into an outer casing

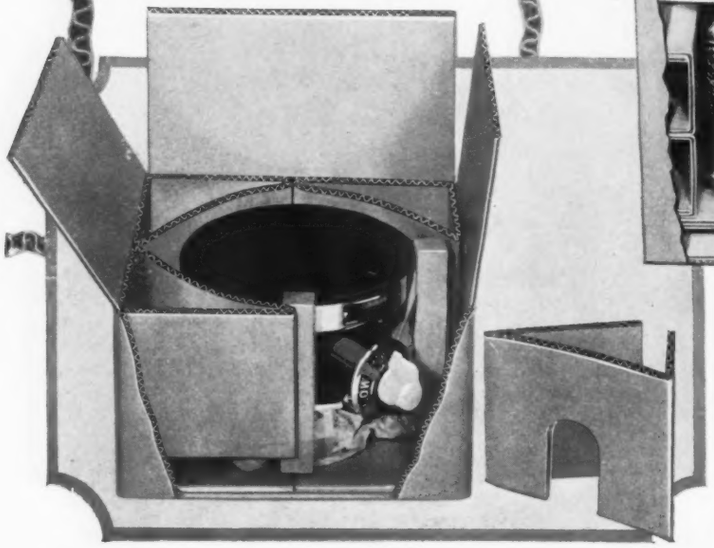


SUCH irregular shapes as those of vacuum cleaners are easily provided for in corrugated containers, and in such a manner that all of the component parts are adequately protected. Notice in the illustration above that the handle, cord and motor are carefully guarded. At the right is a container for an electric iron in which ample provision has been made to shield every part liable to damage and at the same time make the container as simple in construction as possible. To do this requires a careful study of the product and its container



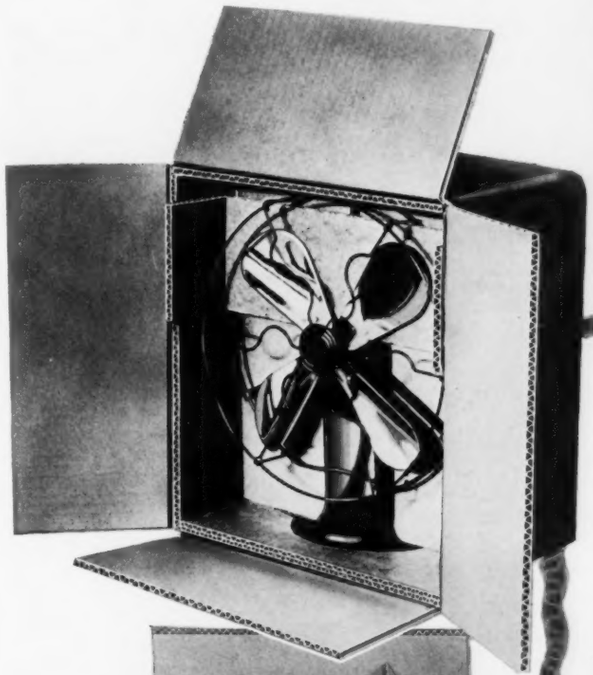
SPEAKERS for radio receiving sets contain some very delicate mechanisms that are easily thrown out of adjustment by undue shocks or jars, and for this reason they must be packed and shipped in such a manner as to entirely eliminate these possibilities

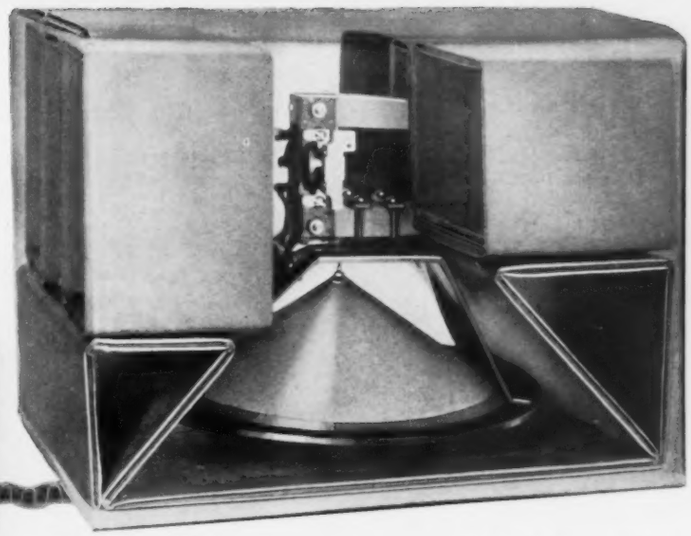




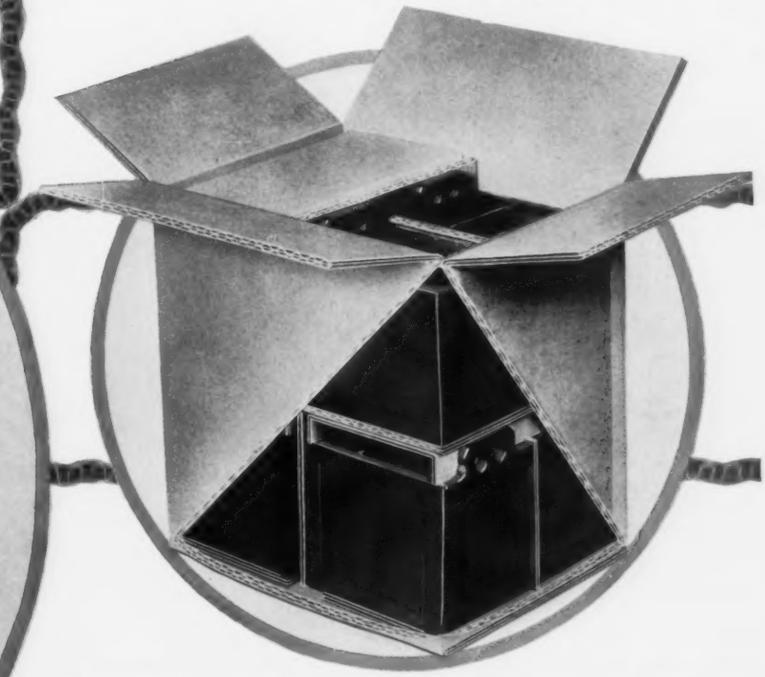
ANOTHER difficult problem in the design of containers is shown directly above. It is that of constructing a corrugated shipping package that will adequately protect a delicate radio receiving set and its accompanying speaker. In this case the packing was accomplished by proper supports for the receiver, with ample spacing members to hold the speaker in place. At the left is a similar problem in which an electric grill is protected from shock by members supported and held in place by the sides of the container

BELOW is a container of comparatively simple construction, in that fans are a simple product to pack for shipment. It should be noticed, however, that ample provisions have been made to protect the fan in every respect and that the package is of ample strength to insure safety from breakage





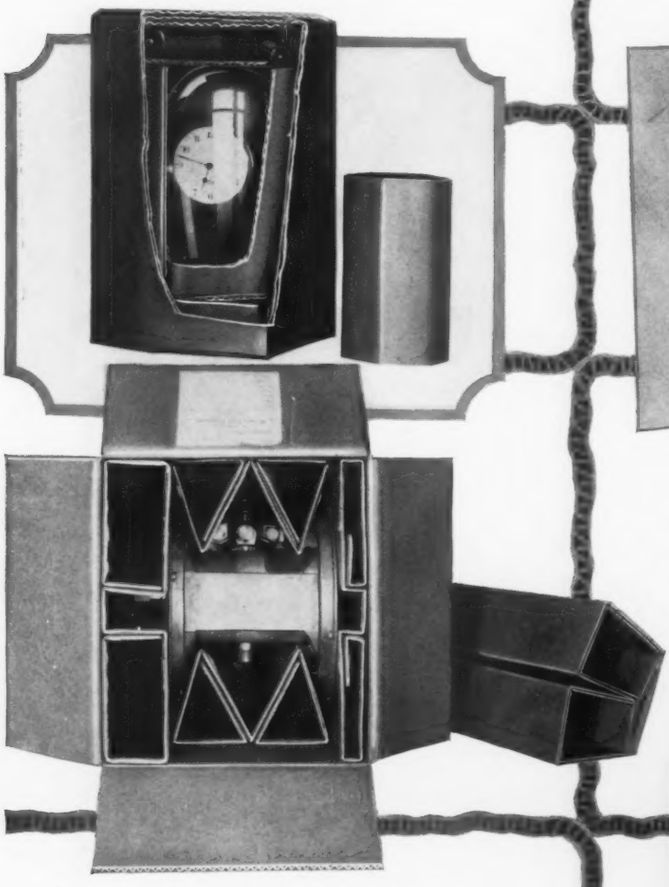
IN designing shipping containers for speakers as that shown above, care must be exercised to protect both the cone and the motor. As the motor usually is of considerable weight, this fact must be taken into consideration in order that it will not crush the cone in the event of failure of any part of the container. Notice in this case that the motor is amply supported from the bottom of the container and that side or lateral movement is also prevented, while ample members are inserted to hold the cone in place during shipment

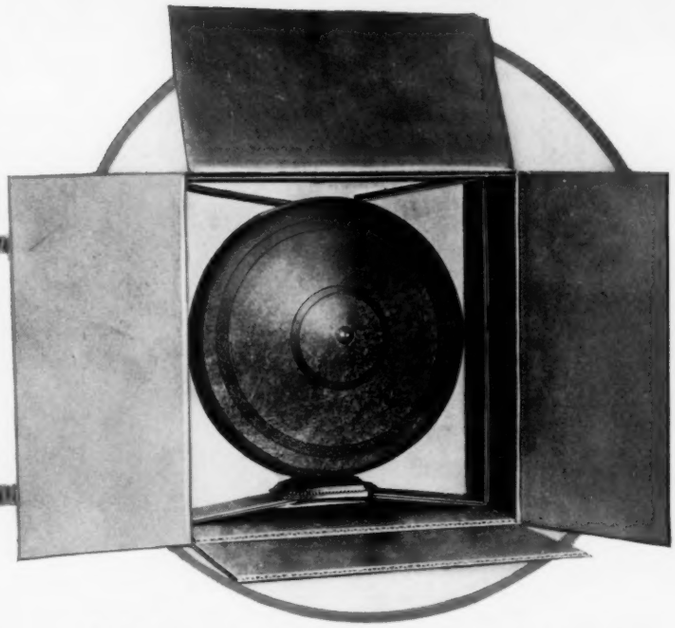


STORAGE batteries that do not contain liquids offer a simple problem for the container designing engineer. This may be seen from the illustration above. All that was necessary here was to provide a container of sufficient strength with other pieces between the batteries

PERCOLATORS such as that shown above are ordinarily made of valuable metals and are somewhat difficult to handle because of the delicate handles, spouts and other protuberances sometimes attached to them, yet, as may be seen from the illustration, they can be protected from damage in shipment by the use of the proper kind of container. Here the percolator rests on a cushioned base, the top is guarded in a similar manner, and other members are arranged to hold the cord and glass top. At the right is a container in which protection is afforded for shipping such fragile devices as reflectors

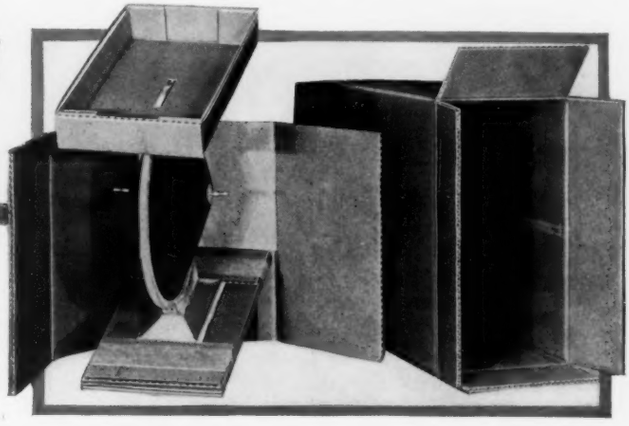
BELOW is an electric clock in a glass case with the container in which it was shipped across the continent without damage. The tube at the right fits inside the glass case and the pendulum is stored above





ABOVE is another example of the manner in which one type of loud speaker is supported in a shipping container. Notice that the top and bottom are both shielded from the outside of the package

METERS of various kinds are difficult to ship without damage because of their delicate construction, yet in containers properly constructed this can easily be done, as may be seen from the manner in which the meter above is protected.



INASMUCH as speakers vary in construction, different methods of constructing shipping containers are often required to insure their protection. In the case above, the speaker is shielded against contact with any part of the outer members of the package by two pads, and at the same time it is completely inclosed before it is assembled in the outer shell of the container. This affords additional protection for the cone and its connections

AT the left and above are illustrations showing still other methods of shipping a hot-plate and a different type of radio receiver. They are both amply protected against damage by necessary supports

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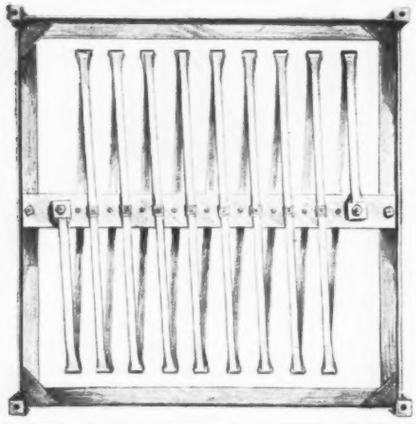
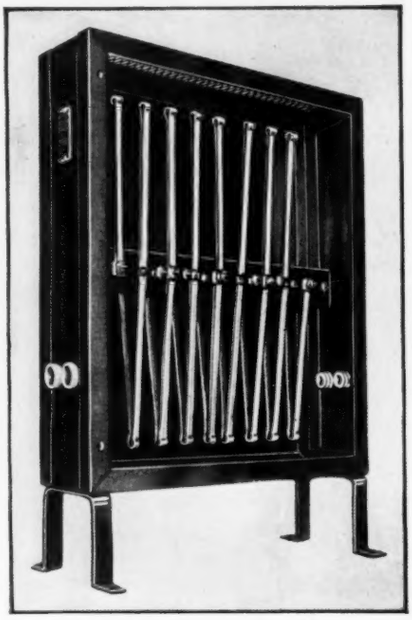
BUSHINGS BEARINGS BAR BRONZE

(Right) Enclosed Ribohm Heater with cover removed. (Left) Standard Ribohm Resistor in skeleton mounting frame.





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These electric air heaters are available either in complete form or as Bar-Type Ribohm sections. The complete air heaters include complete enclosures, switches and such other accessory material as is required. Complete Bar-Type heaters come in capacities of from 2.5 to 20.0 kw. The Bar-Type sections may be assembled into units of any desired capacity.

In many applications, weight is of importance. A Ribohm Air Heater of 20.0 kw. capacity weighs only 75 lbs. The resistive (heating) element in these air heaters is the lightest ever made and it is self supporting. When the switch is turned on, heat pours out —at once. No time is lost in heating up a heavy element and supports.

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MEASURING *Instruments* and *METHODS*

No. 4 of a Series on Electrical Testing Instruments and Methods

In addition to the use of testing and measuring instruments there is much auxiliary equipment required in checking the performance of various kinds of devices

By D. H. BRAYMER
Consulting Engineering Editor
ELECTRICAL MANUFACTURING

IN the first section of this series of articles details of portable indicating instruments were presented together with an outline of the principles of operation and specifications for selecting suitable types and ranges. In the second and third sections similar details were given covering portable graphic instruments using the strip chart to provide a continuous record of the readings during the period that the instrument is used.

In this section information is furnished essential to the selection of instruments and auxiliary equipment required to provide data supplementary to the readings of indicating and graphic instruments as needed in the compilation of test data and the interpretation of results of tests in final report form.

Ohmmeters.—Portable direct-reading instruments for measuring the resistance of a circuit or winding or to compare values of inductance and capacity are very convenient for rapid checks. Such an instrument is shown in Figure 1 and is known as the Type COM Ohmmeter, made by the Roller-Smith Company. This instrument has a range in ohms of from 0.5 to 50,000. To measure the ohmic resistance of a circuit, the two ends of the unknown resistance are connected to two binding posts on the instrument. The plug shown at the top of the instrument is then inserted into one of the four sockets marked 1, 10, 100 and 1000. By rotating the dial and pressing the center button the galvanometer needle can be balanced at zero. The value of the resistance under measurement can then be read on the dial at the point opposite the register mark. The numerals on the dial read directly in ohms when the ratio plug is in the socket marked 1. When the ratio plug is in a socket of higher value, the scale reading is multiplied by the value of the socket used. Resistances can be quickly obtained with this instrument within an accuracy of approximately 1 per cent over its range of operation.

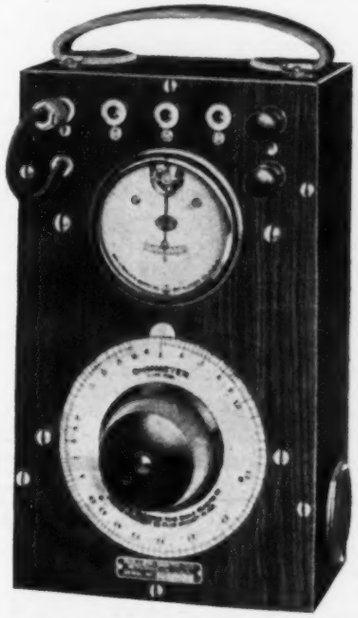


Figure 1

PORTABLE direct-reading instruments for measuring the resistance of a circuit or winding, or to compare values of inductance and capacity are very convenient for rapid checks. Such an instrument is shown at the left and is known as an ohmmeter. This instrument has a range in ohms of from 0.5 to 50,000. Convenient connections are provided on its face with the necessary indicating dials

Figure 2

ANOTHER instrument designed to register resistance in ohms is that shown at the left. It consists largely of a small, high-grade d'Arsonval type voltmeter connected in series with a small dry cell. The connections within the instrument are such that when the two terminals of the instrument are connected the circuit is complete. The scale reads in ohms

Another Roller-Smith instrument that reads ohms less accurately for quick checks is the HTD Circuit Tester

shown in Figure 2. This instrument consists of a small high grade d'Arsonval type voltmeter connected in series with a small dry cell. The connections are such that when the two terminals of the instrument are connected, the circuit is complete. The instrument pointer will then indicate full scale when the terminals are short circuited. The scale reads in ohms from zero to 10,000. The use of this instrument indicates whether or not the circuit under test is complete and also the approximate resistance. It is more reliable than a magneto-generator or A. C. bell-ringing devices, because its reading is not misleading. In the case of a magneto-generator used with a bell, the bell will ring when the circuit contains condensers even though the circuit is not complete. When using a magneto-generator

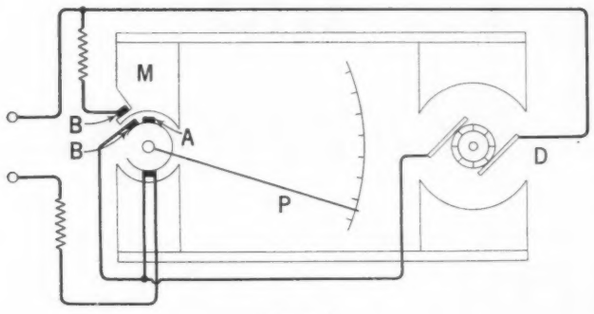


Figure 3

A diagram of the construction of a megger, which is essentially an ohmmeter of the galvanometer type, which indicates resistance in megohms by the movement of a pointer over a calibrated scale

in checking wiring encased in metal conduit, the accumulative leakages will cause a bell to ring because of condenser action and indicate a completed circuit when in fact it is open. This circuit tester will give a true indication also with high reactance or capacity in the circuit when the magneto would give no true indication. This is a small pocket instrument and is convenient to use owing to this feature.

Magneto-Generator.—This device of the familiar telephone type using several permanent magnets to produce a flux cut by a rotated armature coil is convenient for testing circuits of low resistance for open circuits and for grounds. Such a magneto-generator, however, has limitations as already mentioned under the subject of the circuit tester in a preceding paragraph. The average magneto will not generate an e.m.f. of much more than 75 volts when the armature is turned by a hand crank so that when high reactance circuits are encountered, the magneto must be checked by a test lamp when instruments of the types previously described are not available. The test lamp consists of a socket with two flexible terminals brought out and containing an incandescent lamp suitable for the voltage of the circuit tested. This test lamp is then connected in series with the circuit and lights when the circuit is completed and is dark when it is open.

Megger.—This instrument is essentially an ohmmeter of the galvanometer type which indicates resistance directly in megohms by the movement of a pointer over a calibrated scale. The principle of the megger made by J. G. Biddle Company is shown in Figure 3. It consists of a small direct-current generator D, and a galvanometer having a permanent magnet M with a soft iron core, one current coil and two voltage coils. These three coils are attached at a fixed angular position apart, to a shaft which carries the pointer. Both generator and galvanometer are mounted in the same case provided with two binding posts for the connection of the unknown resistance. A crank handle is provided for turning the generator armature by hand. The voltage coils B-B are connected across the terminals of the generator D. The current coil A moves through a gap in such a manner that the field in which it moves is uniform while the pressure coils move from a position midway between the poles where the field is a minimum into a stronger field. The torque due to the current in the current coil is opposed by the torque due to the current in the voltage coils. With no current in the current coil or when the resistance to be measured is extremely high, current through the voltage coils will cause them to come to rest with their plane at right angles to the magnetic field. When the current through the current coil is increased by putting in lower resistances, the current coil drags the moving element around in a clockwise rotation. As the voltage coils come into a stronger field, the resistance to this rotation becomes greater and a final position is reached where the reading of the pointer shows the resistance value measured.

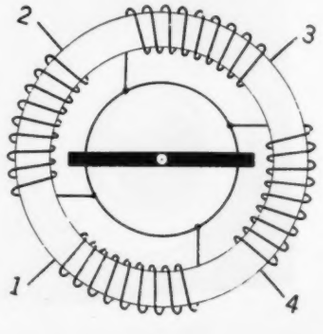
This instrument is independent of the voltage of the generator, since an increase in voltage would increase the current in both the current and the voltage coils in a like proportion. When using the megger to check resistance, the circuit is connected to the instrument and the generator crank turned rapidly. When the pointer comes to rest it will indicate the resistance in megohms on the calibrated scale. The megger is a relatively high-priced instrument and has an accuracy of about 5 per cent in a range of from zero to 2000 megohms. It is used widely for checking insulation resistance during the period of drying out motors and generators. When used for this purpose readings should be made at regular intervals and plotted in the form of a curve. The drying out should be continued until the readings are constant over a considerable period. Insulation resistance as measured by a megger is at best only a rough guide as to the condition of the machine regarding moisture and relative values for the same winding during a drying out process are of more value than readings of other machines having similar windings.

The Phase Rotation Indicator

PHASE Rotation Indicator.—The essential construction of a phase rotation indicator as made by the General Electric Company is shown in Figure 4. It consists of a laminated iron ring with four windings spaced at 90 deg. apart. For use on 2-phase circuits all four windings are used, but on 3-phase circuits only three are used. The terminals marked 1, 2, 3, 4 are connected to the terminals of the A. C. machine under test. The indicator revolves in a direction showing the order in which the e.m.f. of the different phases reach their maximum positive values. When the rotation is clockwise, the e.m.f. reaches a maximum positive value in the order of terminals 1, 2, 3, 4, for a 2-phase machine and 1, 2, 3 for a 3-phase machine. This indication of clockwise rotation when checked against the rotation of the rotor in determining the order of the

Figure 4

THIS diagram shows the essential construction details of a phase rotation indicator. It consists of a laminated iron ring with four windings spaced at intervals of 90 degrees. Mounted over the ring and windings is a pointer free to rotate



phases, is when standing on the drive side of the machine and looking at the rotor from that end. When the phase rotation-indicator shows a counter-clockwise rotation, the e.m.f. reach their maximum positive value in the reversed order, as terminals 3, 2, 1. These indicators operate on the residual magnetism of the larger machines but on smaller machines it is usually necessary to increase the voltage of the machine in order to operate the indicator. The mimimum voltage at which the indicator will operate is 60 volts and the maximum voltage should not be over 250 volts.

The Compass.—While this instrument is useful in checking the current flow in coils as in armature windings and for indicating polarities, they are not always reliable unless carefully used. This is due to the fact that their polarity may become reversed if held in very strong fields.

Tachometer or Revolution Counter.—The most reliable tachometer is the magneto-generator type used with a millivoltmeter. At full speed such a generator usually generates from 200 to 2000 milli-volts depending on the type. This generator is best connected directly to the shaft of the machine through a flexible coupling or indirectly through gears. When a tachometer of this sort is used it should be checked as to calibration after installation on the job.

When checking a tachometer with a stopwatch and a hand-revolution counter, three independent readings should be taken for a full minute. It is also advisable to press the hand-revolution counter on the shaft and start the stopwatch just as the indicator passes the zero mark on the dial. This is a much more accurate method than to try to start and stop the revolution counter and the stopwatch simultaneously. When close accuracy is required in checking the calibration of a tachometer, the electric revolution counter of portable type should be used.

Thermometers.—The ordinary mercury thermometer calibrated in Centigrade or in Fahrenheit degrees is mostly used in general testing as a matter of convenience. The measuring of temperature by other methods will be dealt with later under the subject of temperature measurements. In the use of these mercury thermometers there are some precautions to observe. When applying these thermometers externally to machines or coils oil putty should be used or a felt pad. When using putty just enough should be used to well cover the thermometer bulb and flattened out into a pad about ¾ in. in diameter. A felt pad ⅛-in. thick and 1½-in. square is sufficiently large and should be fastened to the metal by fish glue such as the LePage brand. This glue should be applied about ¼-in. wide around three sides of the pad. This pad should then be pressed on the surface and the glue allowed to set about 15 minutes. The thermometer is then inserted in the open side. Before applying the pad or using the putty to hold the thermometer, the surface should be cleaned of all insulating material so that the bulb rests direct on the metal surface. Care should be exercised in the attaching of thermometers so that there is no interference with normal ventilation through air ducts of a machine. Tape should never be used to support a thermometer since when wrapped around a metal part or a coil it interferes with the radiation or ventilation and will not allow a true reading of the thermometer.

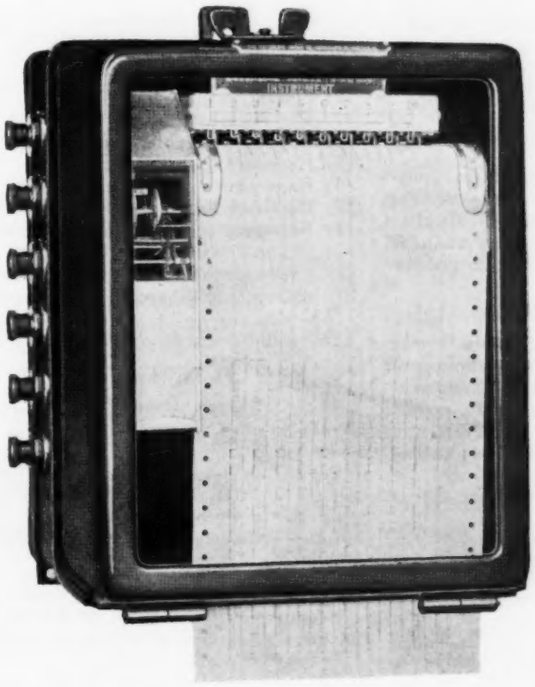


Figure 5

A ten-pen type wall type time recorder. Such instruments are regularly provided with a reroll device which winds up the chart. These instruments can be mounted on any flat surface

Mercury Thermometers

MERCURY thermometers when used in strong alternating current fields are subject to errors in reading owing to the eddy currents induced in the mercury. Alcohol thermometers should be used in such cases. These thermometers are also subject to errors when the temperature of the stem is different from the temperature under which it was calibrated. In case the temperature is approximately known in which the stem will be placed during the test, the thermometer should be calibrated with the stem in about the same temperature. Or the temperature surrounding the stem during test can be measured and the thermometer calibrated afterward in this temperature and a correction applied to the readings.

When a mercury thermometer is used to measure the temperature of ambient air accurately, special precautions should be taken. By ambient air temperature is meant the temperature of the air which coming into contact with the heated parts of a machine, carries off its heat. In such a case the mercury thermometer should be immersed in oil in a suitable heavy cup to avoid errors due to time lag between machine temperature and the ambient temperature when the latter is liable to vary. Such an oil cup is a metal cylinder with a hole drilled in the top for the thermometer. The cylinder should not be smaller than 1 in. in diameter and 2-in. tall.

When a mercury thermometer is used to measure steam temperatures, it should be placed in a mercury well which in turn should project into the steam. Oil wells are not suitable because of the convection currents set up in the oil.

When a mercury thermometer is placed on a machine after it has been shut down in order to get the temperature rise due to no ventilation from the rotation of the rotor, it should be protected from the surrounding air by the felt pad, a piece of putty or a large piece of dry waste. The thermometer should be applied as soon as the rotor comes to rest and on a surface that has been previously cleaned so that the bulb will be in direct contact with the metal.

When taking temperatures on the exteriors of machines, too many thermometers should be used rather than too few so that average conditions can be obtained and any abnormally hot spots located. Variations in temperatures of different parts of a machine are of more value than extreme accuracy of temperature at one particular spot and, in many instances, several readings should be taken to indicate variations under different operating conditions.

Industrial Control Standards

These standards for industrial control apparatus include American Standards, Nema Adopted Standards, Recommended Practices and Suggested Standards for Future Design. The use of them results in greater uniformity and in improved quality of industrial control equipment

THE following article is the first in a series presenting the Industrial Control Standards of the National Electrical Manufacturers Association. This series forms a reference work of practical information concerning the manufacture, test and performance of industrial control equipment

American Standards

The American Standards Association has approved as American Standards certain definitions and rules which were presented to it by the National Electrical Manufacturers Association, either as sole sponsors or as joint sponsor with other organizations. These standards are published herein, together with standards of the National Electrical Manufacturers Association, which have not yet been presented for adoption as American Standards. Those standards which have been approved as American Standards are so designated.

Adopted Standard

102-201 Any standard adopted by the National Electrical Manufacturers Association as a definite standard or as a definite limit shall be known as a National Electrical Manufacturers Association "Adopted Standard."

An Adopted Standard of the National Electrical Manufacturers Association defines a practice or construction to the observance of which in the interest of the public all members of the Association should adhere, and in no event should a member of the Association represent as standard any product falling below such standard.

It is distinctly understood that adopted standards relate only to products commercially standardized and subject to repetitive manufacture, and do not apply to products built to meet the special requirements of individual customers.

Recommended Practice

102-202 Any suggestion or practice which it may be impracticable at the time to recognize as an Adopted Standard, but which it is desirable to recommend as uniform practice, shall be approved and known as a National Electrical Manufacturers Association "Recommended Practice."

A Recommended Practice of the National Electrical Manufacturers Association defines a practice or construction which in the interest of uniformity of procedure is favored by a majority of the members of the interested Divisions or Sections.

Suggested Standards for Future Design

102-203 Any rule or standard which cannot be approved either as an Adopted Standard or as a Recommended Practice but is merely recommended for future designs shall be approved and known as a "Suggested Standard for Future Design."

Industrial Control Standards

*American Standard

A.S.A.—C19—1925-1928

Scope

120-1 (a) The standards in this section cover the following types of control apparatus:

(1) Industrial motor control.
(2) Similar control used for industrial heating.
(3) Rheostats including those for generator field.

(b) Auto-transformers used with starters are included.

(c) Standards for (1) Marine auxiliaries control apparatus, (2) Marine propulsion control apparatus, (3) Mine locomotive control apparatus, and (4) Railway control apparatus are not included.

Service Conditions

Temperature and Altitude

120-2 (a) Control apparatus conforming with these standards shall be suitable for carrying its rated load:

(1) When and where the temperature of the cooling medium does not exceed 40 deg. C.
(2) Where the altitude does not exceed 1000 meters (3300 ft.).

American Standard—Approved 7-9-1925.

Unusual Service Conditions

120-3 (a) The use of apparatus in cooling mediums having temperatures higher than 40 deg. C. or at altitudes greater than 1000 meters should be considered as special applications.

(b) There are further unusual conditions which, where they exist, should be called to the manufacturer's attention. Apparatus for use in such cases may require special construction or protection. Among such unusual conditions are:

(1) Exposure to damaging fumes.
(2) Operation in damp places.
(3) Exposure to excessive dust.
(4) Exposure to gritty or abrasive dust.
(5) Exposure to steam.
(6) Exposure to excessive oil vapor.
(7) Exposure to salt air.
(8) Exposure to vibration, shocks and tilting.
(9) Exposure to explosive dust or gases.
(10) Exposure to the weather or dripping water.

American Standard—Approved 7-9-1925.

Definitions

Electric Controller

120-11 (a) An electric controller is a device, or group of devices, which serves to govern, in some predetermined manner, the electric power delivered to the apparatus to which it is connected.

American Standard—Approved 7-9-1925.

Full Magnetic Controller

120-12 (a) A full magnetic controller is a controller having all of its basic functions performed by electro-magnets.

American Standard—Approved 7-9-1925

NOTE I—By basic functions is usually meant acceleration, retardation, line closing, reversing, etc.

Semi-Magnetic Controller

120-13 (a) A semi-magnetic controller is a controller having part of its basic

*The American Standards Association has approved as American Standards certain Industrial Control Rules which were presented to it by the American Institute of Electrical Engineers, and the National Electrical Manufacturers Association as joint sponsors. These rules are published herein, together with certain rules of the National Electrical Manufacturers Association which have not yet been presented for adoption as American Standards. Those rules which have been approved as American Standards are so designated.

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American Standards

102-201 Adopted Standards
102-202 Recommended Practice
102-203 Suggested standards for Future Design

Industrial Control Standards

120-1 Scope
Service Conditions
120-2 Temperature and Altitude
120-3 Unusual Service Conditions

Definitions

120-11 Electric Controller
120-12 Full Magnetic Controller
120-13 Semi-Magnetic Controller

functions performed by electro-magnets, and part by other means.

American Standard—Approved 7-9-1925.

Manual Controller

120-14 (a) A manual controller is a controller having all of its basic functions performed by hand.

American Standard—Approved 7-9-1925.

Drum Controller

120-15 (a) A drum controller is a controller which utilizes a drum switch as the main switching element.

American Standard—Approved 7-9-1925.

NOTE I—A drum controller usually consists of a drum switch and a resistor.

Starter

120-16 (a) A starter is a controller designed for accelerating a motor to normal speed in one direction of rotation.

American Standard—Approved 7-9-1925.

NOTE I—A device designed for starting a motor in either direction of rotation includes the additional function of reversing and should be designated a controller.

Automatic Starter

120-17 (a) An automatic starter is a starter designed to automatically control the acceleration of a motor.

American Standard—Approved 7-9-1925.

Auto-Transformer Starter

120-18 (a) An auto-transformer starter is a starter having an auto-transformer to furnish a reduced voltage for starting. The device includes the necessary switching mechanism and is frequently called a compensator or auto-starter.

American Standard—Approved 7-9-1925.

Contact

120-19 (a) A contact is a conducting part designed to be united by pressure to another conducting part for the purpose of carrying current.

American Standard—Approved 4-25-1928.

Laminated Brush

120-20 (a) A laminated brush is a contact part consisting of thin sheets of conducting material fastened together so as to secure individual contact by the separate sheets.

Adopted Standard 6-15-1923.

Switch

120-21 (a) A switch is a device for making, breaking or changing the connections in an electric circuit.

American Standard—Approved 7-9-1925.

Disconnecting Switch

120-22 (a) A disconnecting switch is a switch which is intended to open a circuit only after the load has been thrown off by some other means.

American Standard—Approved 7-9-1925.

Motor Circuit Switch

120-23 (a) A motor circuit switch is a switch intended to open under load and will break 150 per cent of its rated load. Such a switch may be used to stop the motor under normal running conditions and also provide means for disconnecting the controller and motor from the line when it is necessary to make repairs.

Adopted Standard—9-12-1927.

Drum Switch

120-24 (a) A drum switch is a switch having electrical connection parts in the form of fingers held by spring pressure against contact segments or surfaces on the periphery of a rotating cylinder or sector.

American Standard—Approved 7-9-1925.

Master Switch

120-25 (a) A master switch is a switch which serves to govern the operation of contactors and auxiliary devices of an electric controller.

American Standard—Approved 7-9-1925.

NOTE I—A master switch may be automatic, as a float switch or pressure regulator. It may be manually operated, as a drum, push button or knife switch.

Contactor

120-26 (a) A contactor is a device for repeatedly establishing and interrupting an electric power circuit.

American Standard—Approved 7-9-1925.

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120-15 Drum Controller
120-16 Starter
120-17 Automatic Starter
120-18 Auto-Transformer Starter
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120-21 Switch
120-22 Disconnecting Switch
120-23 Motor Circuit Switch
120-24 Drum Switch
120-25 Master Switch
120-26 Contactor
120-27 Magnetic Contactor
120-40 Resistance
120-41 Resistor
120-42 Rheostat
120-43 Resistive Conductor
120-44 Constant Torque Resistor
120-45 Fan Duty Resistor
120-46 Load Lighting Resistor

Kinds of Protection

120-50 Low (or under) Voltage Protection
120-51 Low (or under) Voltage Release
120-52 Phase-Failure Protection
120-53 Phase-Reversal Protection
120-54 Overload Protection

Magnetic Contactor

120-27 (a) A magnetic contactor is a contactor actuated by electro-magnetic means.

American Standard—Approved 7-9-1925.

Resistance

120-40 (a) Resistance is the opposition offered by a substance or body to the passage through it of an electric current and converts electric energy into heat. Resistance is the reciprocal of conductance.

American Standard—Approved 7-9-1925.

Resistor

120-41 (a) A resistor is a device used primarily because it possesses the property of electrical resistance. A resistor as used in electric circuits for purposes of operation, protection or control, commonly consists of an aggregation of units.

American Standard—Approved 4-25-1928.

Rheostat

120-42 (a) A rheostat is a resistor which is provided with means for readily varying its resistance.

American Standard—Approved 7-9-1925.

Resistive Conductor

120-43 (a) A resistive conductor is a conductor used primarily because it possesses the property of electrical resistance.

American Standard—Approved 7-9-1925.

Constant Torque Resistor

120-44 (a) A constant torque resistor is a resistor for use in the armature or rotor circuit of a motor in which the current remains practically constant throughout the entire speed range.

American Standard—Approved 7-9-1925.

Fan Duty Resistor

120-45 (a) A fan duty resistor is a resistor for use in the armature or rotor circuit of a motor in which the current is approximately proportional to the speed of the motor.

American Standard—Approved 7-9-1925.

Load Limiting Resistor

120-46 (a) A load limiting resistor is a resistor which is used in a circuit for the purpose of reducing the current in that circuit to a safe value.

Adopted Standard 10-20-1924.

Kinds of Protection

Low (or under) Voltage Protection

120-50 (a) Low (or under) voltage protection is the effect of a device operative on the reduction or failure of voltage to cause and maintain the interruption of power to the main circuit.

American Standard—Approved 7-9-1925.

Low (or under) Voltage Release

120-51 (a) Low (or under) voltage release is the effect of a device, operative on the reduction or failure of voltage, to cause the interruption of power to the main circuit but not to prevent the re-establishment of the main circuit on return of voltage.

American Standard—Approved 7-9-1925.

Phase-Failure Protection

120-52 (a) Phase-failure protection is the effect of a device operative upon the failure of power in one wire of a polyphase circuit, to cause and maintain the interruption of power in all of the circuit.

American Standard—Approved 7-9-1925.

Phase-Reversal Protection

120-53 (a) Phase-reversal protection is the effect of a device operative on the reversal of the phase-rotation in a polyphase circuit, to cause and maintain the interruption of power in all of the circuit.

American Standard—Approved 7-9-1925.

Overload Protection

120-54 (a) Overload protection is the effect of a device operative on excessive current to cause and maintain the interruption of current flow to the device governed. When it is a function of a controller for a motor, the device employed shall provide for interrupting any operative overloads, but shall not be required to interrupt short circuits.

American Standard—Approved 7-9-1925.

NOTE I—By operating overload is meant a current not in excess of six times the rated current for alternating current motors nor in excess of four times the rated current for direct current motors.

Relays

Relay

120-60 (a) A relay is a device that is operative by a variation in the conditions of one electric circuit to effect the operation of other devices in the same or another electric circuit.

American Standard—Approved 4-25-1928.

General

120-61 (a) Where relays operate in response to changes in more than one condition, all functions should be mentioned.

Recommended Practice 11-2-1922.

Phase-Rotation Relay

120-62 (a) A phase-rotation relay is a relay which functions in accordance with the direction of phase rotation.

American Standard—Approved 7-9-1925.

Current Relay

120-63 (a) A current relay is a relay which functions at a predetermined value of current. A current relay may be either an over-current relay or an under-current relay.

American Standard—Approved 7-9-1925.

Overload Relay

120-64 (a) An overload relay is an over current relay in the circuit of a motor which functions at a predetermined value of the current to cause the disconnection of the motor from the line.

American Standard—Approved 7-9-1925.

Voltage Relay

120-65 (a) A voltage relay is a relay which functions at a predetermining value of voltage. A voltage relay may be either an over-voltage relay or an under-voltage relay.

American Standard—Approved 7-9-1925.

Differential Relay

120-66 (a) A differential relay is a relay which functions by reason of the difference between two quantities such as current or voltage, etc.

American Standard—Approved 7-9-1925.

NOTE I—This term includes relays heretofore known as "ratio balance relays," "biased relays," and "percentage differential relays."

Frequency Relay

120-67 (a) A frequency relay is a relay which functions at a predetermined value of frequency. A frequency relay may be either an over-frequency relay or an under-frequency relay.

American Standard—Approved 7-9-1925.

Temperature Relay

120-68 (a) A temperature relay is a relay which functions at a predetermined temperature in the apparatus protected.

American Standard—Approved 7-9-1925.

Open-Phase Relay

120-69 (a) An open-phase relay is a relay which functions by reason of the opening of one phase of a polyphase circuit.

American Standard—Approved 7-9-1925.

Step-Back Relay

120-70 (a) A step-back relay is a relay which operates to limit the current peaks of a motor when the armature or line current increases. A step-back relay may, in addition, operate to remove the cause of the limitation to the current peaks of a motor when the armature or line current decreases.

American Standard—Approved 7-9-1925.

NOTE I—When used with a motor having a flywheel, the relay causes the momentary transfer of stored energy from the flywheel to the load; but does not limit the current peaks if the load is sustained for a considerable interval after the relay operates.

Qualifying Terms of Relays

Notching

120-80 (a) A qualifying term applied to any relay indicating that a predetermined number of separate impulses are required to complete operation.

American Standard—Approved 4-25-1928.

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Relays

120-60 Relay
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120-68 Temperature Relay
120-69 Open-Phase Relay
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Qualifying Terms of Relays

120-80 Notching
120-81 Inverse Time
120-82 Definite Time
120-83 Instantaneous

Properties and Characteristics of Apparatus

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120-91 Air (Used as a Prefix)
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120-95 Resisting (Used as a Suffix)
120-96 Dust Proof Apparatus
120-97 Dust Tight Apparatus
120-98 Drip Proof Apparatus
120-99 Drip Tight Apparatus

Inverse Time

120-81 (a) Inverse time is a qualifying term indicating that there is purposely introduced a delayed action, which delay decreases as the operating force increases.

American Standard—Approved 4-25-1928.

Definite Time

120-82 (a) A qualifying term applied to any relay indicating that there is purposely introduced a delay in action, which delay remains substantially constant regardless of the magnitude of the quantity that causes the relay to function. (For quantities slighly above the minimum operating value, the delay may be inverse.)

American Standard—Approved 4-25-1928.

Instantaneous

120-83 (a) A qualifying term applied to any relay indicating that no delay is purposely introduced in its action.

Adopted Standard—Approved 4-25-1928.

Properties and Characteristics of Apparatus

Distinctive Features

120-90 (a) Distinctive features are exclusive elements of a design which are characteristic or which are not common to other designs.

Adopted Standard 6-13-1923.

Air (Used as a Prefix)

120-91 (a) The prefix "air" applied to a device which interrupts an electric circuit indicates that the interruption occurs in air.

American Standard—Adopted 7-9-1925.

Oil (Used as a Prefix)

120-92 (a) The prefix "oil" applied to a device which interrupts an electric circuit indicates that the interruption occurs in oil.

American Standard—Adopted 7-9-1925.

Tight (Used as a Suffix)

120-93 (a) Apparatus is designated as water tight, dust tight, etc., when so constructed that the enclosed case will exclude the specified material.

American Standard—Adopted 7-9-1925.

Proof (Used as a Suffix)

120-94 (a) Apparatus is designated as splash proof, dust proof, etc., when so constructed, protected or treated that its successful operation is not interfered with when subjected to the specified material or condition.

American Standard—Approved 7-9-1925.

Resisting (Used as a Suffix)

120-95 (a) Apparatus is designated as moisture resisting, fume resisting, etc., when so constructed, protected or treated that it will not be readily injured when subjected to the specified material.

American Standard—Adopted 7-9-1925.

Dust Proof Apparatus

120-96 (a) Dust proof apparatus is apparatus so constructed or protected that the accumulation of dust will not interfere with its successful operation.

American Standard—Approved 7-9-1925.

Dust Tight Apparatus

120-97 (a) Dust tight apparatus is apparatus so constructed that the dust will not enter the enclosing case.

American Standard—Approved 7-9-1925.

Drip Proof Apparatus

120-98 (a) Drip proof apparatus is apparatus so constructed or protected that its successful operation is not interfered with when subjected to falling moisture or dirt.

Adopted Standard 11-18-1916.
Adopted Standard 1-15-1925.

Drip Tight Apparatus

120-99 (a) Drip tight apparatus is apparatus so protected as to exclude falling moisture or dirt. Drip tight apparatus may be semi-enclosed apparatus if it is provided with suitable protection integral with the apparatus, or so enclosed as to exclude effectively falling solid or liquid material.

American Standard—Approved 7-9-1925.

(*To be continued*)

Characteristics That Determine the *Selection* of MOTORS

No. 12 of a Series Discussing Motors of Different Types

The accompanying information is a continuation of the discussion of the characteristics of variable speed motors, started last month

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IN SECTION No. 11 of this series of articles, which was published in the March issue of ELECTRICAL MANUFACTURING, it was explained that variable speed motors could well be defined as those having a wide range of speed variation, governed only by the control employed and the nature and requirements of the loads these motors drive. The following is a continuation of the discussion of the characteristics of these motors.

Figure 5 shows the efficiencies of the slip ring induction motor operating under the same conditions as the 75 hp. multi-speed motor. Comparing these curves with those shown in Figure 2 of the December issue, shows very clearly the difference in operating characteristics. The 1200 r.p.m. efficiency curve is the only curve which approaches the efficiencies of the multi-speed motor. No resistance is inserted in the secondary circut of the slip ring motor at 1200 r.p.m., as this is its normal operating speed. The efficiencies drop off rapidly as resistance is inserted in the rotor or the secondary circuit to obtain 900 r.p.m. and then increased to obtain speeds of 600 and 450 r.p.m., respectively. The full load efficiency of this slip ring motor operating at 450 r.p.m. and carrying 75 hp. is only 35 per cent as compared to nearly 85 per cent for the 75 hp. multi-speed squirrel cage induction motor operating at 450 r.p.m. This comparison shows very clearly the main disadvantage in using the slip ring motor for variable speed applications. The loss in efficiency is so great that there would have to be a very distinct gain in production to warrant the increased cost of operating this type of motor over a variable speed range.

Figure 6 shows the power factors of the same slip ring motor operating at the same speeds as the 75 hp. multi-speed motor mentioned above. The full load power factor of this motor operating at the different speeds is

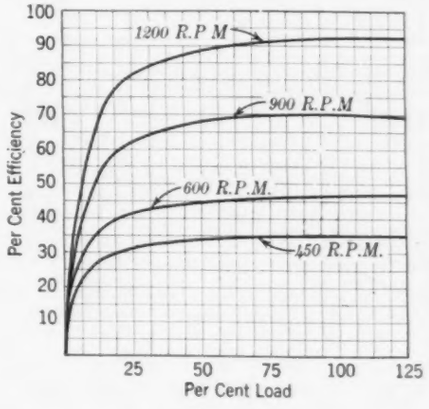


Figure 7

This chart shows the efficiency characteristics of the same slip ring motor, previously discussed, operating with a constant torque rating

fairly good. One singular thing that will be noticed is that the power factor is highest at 450 r.p.m. and lowest at 1200 r.p.m., a direct reversal of the conditions shown in

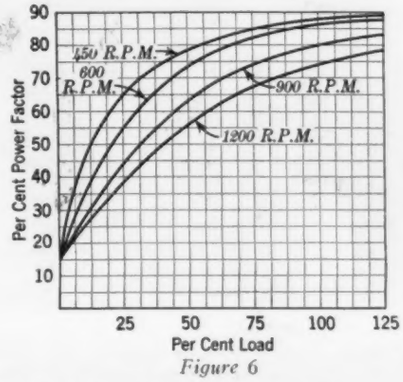


Figure 6

FIGURE 6, at the left, shows the power factors of the same motor operating at the same speeds as the 75-hp. motor described under Figure 5 in the March issue of ELECTRICAL MANUFACTURING, *while Figure 8 shows that under conditions of constant torque operation the load on the motor is practically constant at all speeds*

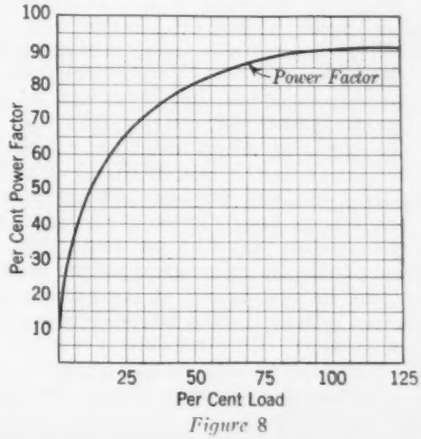


Figure 8

Figure 3 of the December, 1928, issue of ELECTRICAL MANUFACTURING, for the 75 hp. multi-speed squirrel cage induction motor. While this fact has no particular significance as regards a comparison of characteristics there is a definite reason for it. A slip ring motor rated to deliver 75 hp. at all four speeds, would be practically the equivalent of a 200 hp. motor at 1200 r.p.m. The result is, that when running at 1200 r.p.m. the same condition exists as if the motor was rated 200 hp. and was carrying only part of its rated load, hence, the low power factor.

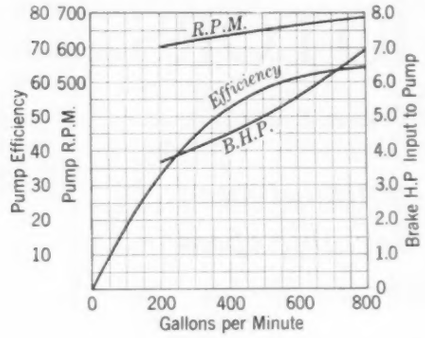


Figure 9

The various characteristics of an 800 gallon per minute sewage pump

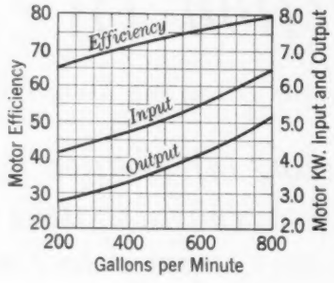


Figure 10

The efficiency kilowatt input and output of a 7½-hp., 720-r.p.m. slip ring motor

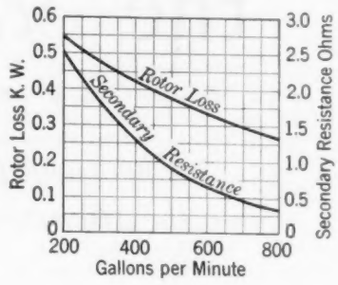


Figure 11

Rotor loss and secondary resistance vary with different outputs

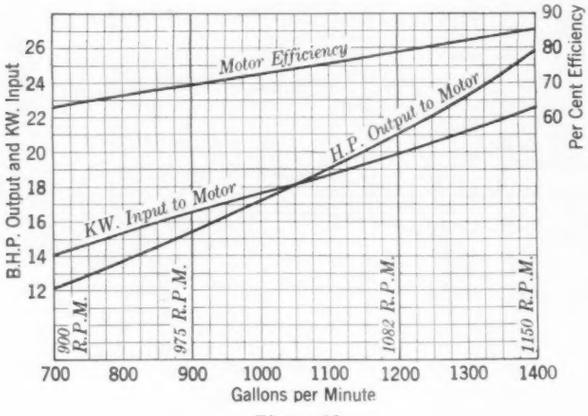


Figure 12

A comprehensive study of a large slip ring motor for a centrifugal pump drive. It is rated at 30 hp. at 1150 r.p.m.

When running at 450 r.p.m., the motor is rated at 75 hp. and delivering its full rating with a dead I^2R load of resistance in the secondary. The result of this I^2R loss is practically the same as a mechanical load, hence the higher power factor. A further comparison of these power factors will show more interesting facts.

The 75 hp. multi-speed motor previously mentioned had power factors at full load of 93, 92.8, 74 and 69 per cent at speeds of 1200, 900, 600 and 450 r.p.m., respectively.

The slip ring motor carrying a load of 75 hp. has power factors at this load of 88, 86, 80 and 74 per cent at speeds of 450, 600, 900 and 1200 r.p.m., respectively.

The average power factor of the multi-speed motor for all four speeds was 82.2 per cent. The average power factor of the slip ring motor for the same speeds is 82.0 per cent, so that as far as the average power factor is concerned, there is very little difference between the two types of motor. The great difference in efficiency, however, cannot be disputed, and should necessitate a thorough study of a particular application, before the slip ring type of motor is selected.

The slip ring motor discussed above was given a constant horsepower rating to give a direct comparison with the 75 hp. multi-speed motor, which had been discussed in detail in the December issue. As a further basis of comparison the slip ring motor, through the use of its resistance control could be given a constant torque-variable horsepower rating. The application of such a motor would be for machine tool work, lathes, planers, drill presses, and other similar applications, where speed control is desirable. For these applications, the load must be fairly constant, or the slip ring motor may prove unstable and unsatisfactory as mentioned previously. There are some of these applications, for example, a drill press, where some fluctuation of speed during the unloaded part of the duty cycle would not prove much of a drawback, inasmuch as the motor would resume its proper speed again, after the piece of work had been started.

The efficiency characteristics of the same slip ring motor previously discussed, with a constant torque rating are shown in Figure 7. It will be noticed that the average efficiency is slightly higher than indicated in Figure 5 for the constant horsepower rating. However, the poor efficiency at the lower speeds is very noticeable. Under conditions of constant torque operation, the load on the motor, either mechanical or combined mechanical and resistance load, is practically constant at all speeds, resulting in a uniform power factor characteristic at all speeds, practically equivalent to the single curve characteristics shown in Figure 8. A further analysis of a particular application will serve to indicate how a study may be made to utilize the slip ring motor for a particular application.

Sewage disposal plants have brought up some interesting

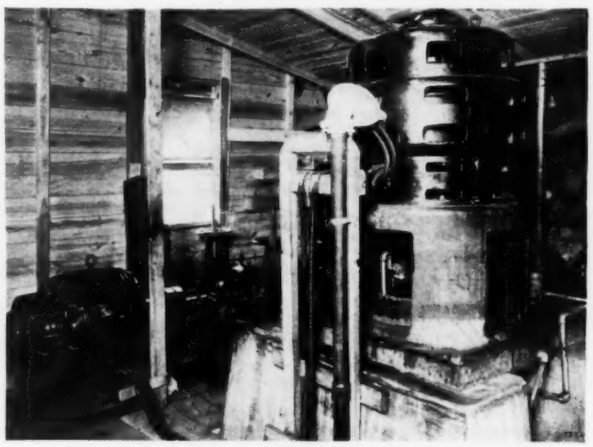


Figure 13

An installation of a 200-hp. vertical slip ring motor driving a deep well pump and a 75-hp. slip ring motor driving a centrifugal pump

motor problems. Recent developments have been towards automatically controlled plants, consisting of centrifugal pumps driven by slip ring motors operated by float switch mechanisms so as to maintain a constant height or depth of liquid in any one tank. The process goes from one tank to another, entirely through the automatic operation of the float switches. The control for any one motor consists of steps of resistance which are cut out or in by the rise or fall of the liquid and the floating contact, so as to provide whatever output is necessary from the motor and direct connected pumps to maintain the pre-determined level in the tank. A very interesting problem is encountered here in pre-determining the proper amount of resistance for each step, in order that the pump may perform its proper duty through the motor output. However, this has been successfully done and the operation of these plants is very satisfactory.

As an example of the factors which must be considered for such an application, Figure 9 shows various characteristics for an 800 gallon per minute centrifugal sewage pump. The pump r.p.m., efficiency, and required b.h.p. are given for various outputs in gallons per minute. The slip ring motor must be designed to provide the necessary b.h.p. at the various speeds in order to properly utilize the pump's characteristic.

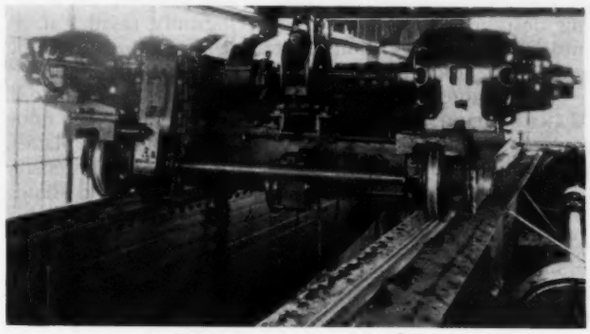


Figure 14

A typical application of a slip ring induction motor as it is employed to operate a traveling overhead crane

Figure 10 shows the efficiency, kw. input and output for a 7½ hp., 720 r.p.m. slip ring motor designed to drive this particular pump. The use of proper resistor units in the secondary circuits determines the success of an installation. Figure 11 shows how the rotor loss and secondary resistance vary with different outputs from the pump. These curves give a very good picture of what is happening within the motor and its control circuit. The motor is, of course, very inefficient at the slower speeds and smaller outputs, but for the particular application, the advantages of the flexible control which is provided in the plant, offsets the disadvantages in a large measure.

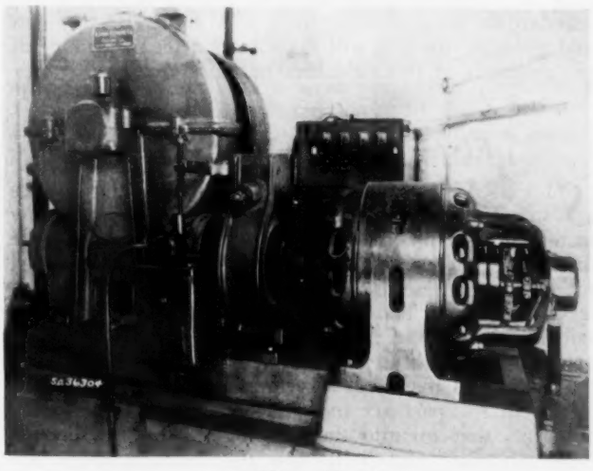


Figure 15

Sling ring induction motors are also used for elevator drives, and a typical installation is that shown in the illustration above

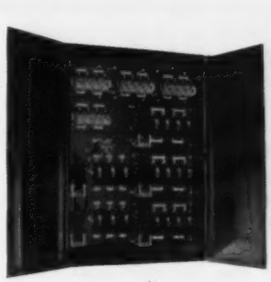


Figure 16

Figure 17

A controller for automatic acceleration of a slip ring motor while the resistance for the controller is shown in Figure 17

Figure 12 shows a comprehensive study of a larger slip ring motor for centrifugal pump drive. This motor is rated 30 hp. at 1150 r.p.m. The working range of the motor is between the speeds of 900 and 1150 r.p.m. The drop in efficiency is not quite as pronounced in the case. The load varies approximately as the cube of the speed which accounts for the large increase in b.h.p. required between the speed ranges indicated.

A 200 hp. vertical slip ring motor driving a deep well pump, and a 75 hp. slip ring motor driving a centrifugal booster pump are shown in Figure 13. Figure 14 shows a typical application for slip ring induction motors, operating a traveling overhead crane. Figure 15 illustrates a slip ring motor geared to elevator drive. This type of motor provides a flexible elevator control, but it is not generally used, because of its low operating efficiency.

Control:—In Electrical Manufacturing for February, 1929, the cost of control for slip ring elevator motors was estimated as about equivalent, except for special cases, to that for multi-speed motors. In either case the control plays a very vital part in the operation of the motor and bears a large ratio in cost to the cost of the motor. In some cases, the cost of control may exceed that of the motor considerably. However, when the application warrants the expense, very complete and satisfactory control over the motor may be obtained.

Figure 16 shows a controller for automatic acceleration of a slip ring motor. This particular panel is rated 150 hp., 440 volts, 3 phase. The two contactors on the large panel at the upper right are for handling the primary and enable the motor to be operated in either the forward or reverse direction. A thermal type overload relay is mounted on the same panel, to provide overload protection. Undervoltage protection is inherent. The remaining panels are for accelerating by varying the resistance in the secondary of the motor. The smaller contactors are used for the resistor sections which are short circuited first. The larger contactors are used for the resistors which remain in the circuit the longest.

The resistance unit for this controller is shown in Figure 17. The resistance part of the control is always required, whether or not, automatic control is used.

This discussion has covered only one type of control. It may be said that the proper control can be provided to take care of practically any operating conditions that the user may desire.

The flexibility of the slip ring motor with its accompanying control is almost without limit, but the questions of first cost, operating characteristics and operating costs should always be taken into consideration.

Editorials

Tie-In with the Golden Jubilee

EVERY electrical manufacturer who remembers his electrical history and who is alive to the news of the hour knows that this is the "Golden Jubilee" year of the electric light. Extensive plans have been laid for celebrating in a spectacular way the fiftieth anniversary of the invention of the incandescent lamp. The celebration, to call it that, begins on May 31 at Atlantic City and will continue through the summer and early fall, in various parts of the country, and will come to a climax on Edison Night in October. Herein lies an unusual opportunity for the electrical manufacturer to practice what he preaches. Spectacular displays of lighting should everywhere be supported by all concerns in the industry, and certainly it would not be amiss for manufacturers to demonstrate their own faith in what they sell by making a more generous use themselves of electrical illumination in one form or another.

What's the Next Big Appliance?

IRON, vacuum cleaner, clothes washer, toaster, ironer, dishwasher, range, and refrigerator, these electrical appliances and a host of others, one by one, have come into the modern home to free its members from drudgery and to raise the standard of living in the home. Year by year each of these appliances has steadily grown in favor and as it has been improved has steadily increased its service to the home.

What next?

Probably no one can answer the question. Certainly ELECTRICAL MANUFACTURING has no desire to play prophet, but it is willing to hazard a guess.

Editorially, we are inclined to believe that just over the horizon is a major electrical device that will heat the home in the winter and cool it in summer. This device will be installed in the basement of the home. It will spell the doom of the coal bin and the ash can. It will mean houses without chimneys, or a chimney only for the fireplace.

Electrical heating of the home is not a crazy dream. It has been accomplished in numerous instances. Satisfaction or cost may be open to question, but nevertheless it has been done. It has usually been accomplished by space heaters, of one kind or another, scattered through the house. By what seems to be an improved method now being tried out in a large number of houses in Fort Wayne and elsewhere, electric heat is produced in basement equipment and existing facilities are utilized for radiation by hot water, steam, or hot air. This does away with any necessity for changing standard heating equipment built into and through a house or installing numerous space heaters through the rooms.

Some degree of electrical cooling of the home in summer has been possible through use of electric fans. And the old-fashioned ice-box has been made over into the splendid modern electric refrigerator. If a box can be so cooled, cannot the same thing be accomplished for a room or a number of them? If in the theater, why not in the home? Difficulties? Overcome them!

And when that is done why not combine the heating and cooling service into one piece of equipment to replace the venerable coal burning furnace or the oil-burner? Only a fool will say that it is impossible, because even more difficult problems have been solved, and the solutions are found in the commonplace equipment of modern life. Research and experiment already under way may in good time be expected to produce results. Meanwhile, who will name this coming major electric appliance?

The Need for Adequate Aircraft Lighting Equipment

WITH the rapid advances in commercial aviation, the need has arisen for lighting equipment on airplanes both to enable the pilot to see outside and follow landmarks and also to make possible the reading of instruments inside the plane. The problem confronting designers of this equipment logically divides itself into three steps: illumination requirements, lighting equipment, and energy supply and distribution.

As explained elsewhere in this issue of ELECTRICAL MANUFACTURING, there is much work to be done toward standardizing the equipment used on airplanes. At present there are no data available on the intensity of the illumination needed for landing lights, no standard lamp is available, and there are no standards of wiring or current supply systems.

The design of lamps for automotive use required a great amount of investigation in order to secure the most efficient and satisfactory operation. It appears that the design of lamps, particularly the landing lamps for airplanes, will be an even greater problem unless some standard of installation, wiring and operation can be worked out at the present stage of the industry. It, therefore, seems advisable to start investigations immediately that will lead to a standardization of airplane lighting equipment, of the location of this equipment and of the method of wiring. At the same time recommended practice should be established for battery and generator systems and sizes to be used for night flying service. The electrical industry has had enough experience in standardization work to realize that if it can standardize the equipment to be used in a relatively new and growing field, it will save itself a lot of trouble as the demands of this field become more complex.

Fixture Prices Must Go Up

SEVERAL years ago the state of the lighting fixture manufacturing industry was such that, when raw materials went up, it was reasonable to expect the price of fixtures to come down. However, all this has changed recently, and these manufacturers are beginning to realize that this is a poor way to do business. It has been said that because of the business practices of this group, many of the lighting fixture makers had more money ten years ago than they have today.

Within the past six months the prices on some raw materials that go into the making of lighting fixtures have advanced materially and the manufacturers are faced with the problem of selling at the same price and taking a loss, or raising prices, on such numbers of

their lines as are affected by this change in raw material prices, and making a profit. Undoubtedly, the rational solution to this problem is a revision of prices upward.

Regardless of past business practices in this branch of the electrical industry, every one of these manufacturers will admit that he is in business to make money, and in the light of the advances which have been made in the lighting fixture business, through the leadership of the Artistic Lighting Equipment Association, it is gratifying to note that a number of the manufacturers have either already announced an advance in prices or have signified their intention of raising prices.

How Many Associations?

NOT long ago someone asked, "How many associations are there in the electrical industry?" The Society for Electrical Development was asked to give the answer. Here it is: Including radio and electric railway organizations, there are 33 national bodies in the industry. Sectional associations number 74. And the local associations run up to 250. This makes a grand total of 357 associations of all kinds in the electrical industry. It does not seem possible, and yet the names of all of these associations are readily available. Has anyone estimated the amount of money required to support these associations annually? Probably not. It must certainly run into millions, perhaps many millions if all costs are counted in. In this setup there is opportunity not only for tremendous service, but also waste of amazing proportions. The industry has a right to demand that every association justify itself or be discarded.

Justice in Modern Business

FAITH in his chosen profession; loyalty to his company; justice to all with whom he deals; these constitute the creed of the purchasing agents in many industries, including the electrical, who are working together on their common problems through the leadership of the National Association of Purchasing Agents. These men, who are the buyers of equipment and supplies of all kinds and in varying amounts in all the various industries of the country, have realized that honesty in business dealings really pays dividends to both their respective companies and to themselves.

Elsewhere in this issue the organization and activities of this association are described, and their principles and standards are set forth. Due to the general character of this association, there are many specialized activities in which it is engaged that are of no immediate interest to the electrical manufacturer, but many of the problems confronting purchasing agents in every industry are common to the electrical industry; and the purchasing agents, the buyers of raw materials and supplies, for electrical manufacturing plants, can well afford to follow the activities of the National Association of Purchasing Agents.

With the exception of the Department of Commerce, the N. A. P. A. is one of the foremost proponents of commercial standardization and simplification. The simplified invoice, standard purchase order, standard catalog, standard conveyor contract, standard coal contract form, and the standard iron and steel scrap specifications have resulted from the efforts of committees of this association. This standardization work is a striking example of the many activities of the national association and its fifty-seven affiliated local associations which will enable electrical buyers to improve their own efficiency and reduce costs for their employers.

Can Business Govern Itself?

ELECTRICAL manufacturers for many months have been showing an increasing interest in the matter of trade practice conferences. And in several groups plans for a number of such conferences are under consideration. For all who are interested in this subject, the forthcoming annual meeting of the Chamber of Commerce of the United States, at Washington, D. C., holds an unusual opportunity. As a measure of the progress made in the regulation of business by business itself, the Chamber will devote a special round table session to the discussion of trade practice conferences.

That progress is being made is indicated by the questions to be taken up which are of a practical rather than theoretical kind. Some of these are:

Has the adoption of codes of business practice been effective?

What practices can be most successfully eliminated through trade practice conferences?

Are trade associations meeting the trade practice development satisfactorily?

How can trade practice agreements be enforced?

May an industry set up machinery to secure observance of conference rules?

How far should an industry go in policing an agreement?

How do State anti-trust laws apply to agreements concluded at trade practice conferences?

Are more laws needed to make such agreements effective?

Mass Merchandising

EFFECTS of large scale selling, in many respects the most revolutionary development in the modern world of business, will be brought under scrutiny at a special round table session of the Chamber of Commerce of the United States which will hold its annual meeting in Washington beginning April 29.

It is recognized that mass merchandising is the twin sister of mass production but the former is in an evolutionary stage.

Here are some of the questions business will ask itself:

What distribution economies are affected by mergers of manufacturers of non-competing commodities?

Will the retail store of the future be a composite of existing types?

Is the present tendency toward group action by retailers and by wholesalers and retailers combined leading ultimately to chain organization of distribution?

Will the individual wholesaler or retailer, operating independently, survive?

Do chains tend to improve retail methods?

How will increasing competition between chains affect such organizations?

These and many other questions bearing on the same problem will be discussed from the viewpoint of producer, distributor and consumer.

All of the foregoing questions have been asked time and again by electrical manufacturing sales executives. And the questions grow more pressing month by month. The round table discussion at Washington should be productive of new thought on all of them, or at least should bring out facts to serve the electrical industry in setting up its marketing plans for today and tomorrow. It is all well enough for somebody to bring out the ancient line, "My business is different," but the fact remains that the most successful salesmanagers in the electrical business have learned how to adopt and adapt policies and plans tested in other fields.

Lay Out Blanks for Stampings to

Minimize Waste

No. 4 of a Series on the Design and Manufacture of Stampings

Much can be accomplished in cutting down waste in laying out blanks if a little time is spent in deciding how to do the job most efficiently

By J. K. Olsen

Chief Draftsman, Stewart-Warner Speedometer Corp.

IT is, of course, impossible to try to cover all the various combinations of blank layouts, as the field is far too large and diversified to make such an attempt practical. The accompanying illustrations are given to picture a few typical arrangements of blanks in strips and should serve sufficiently in giving a good general idea of how the subject is handled in actual practice.

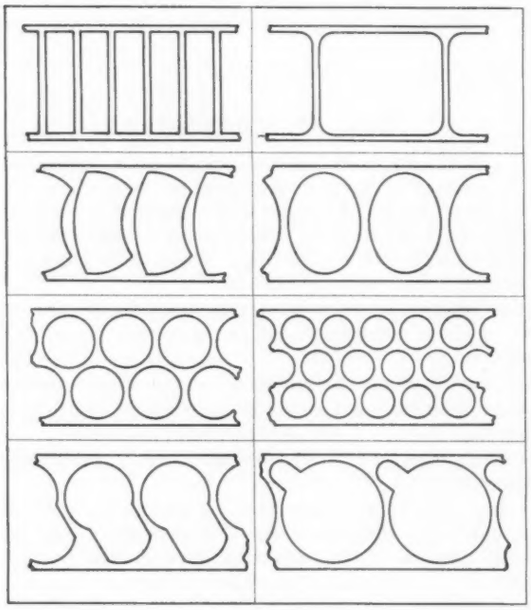


Figure 1

These parts as well as those shown in Figures 2 and 3 are examples of parts to be found in everyday use and are typical of millions of similar flat, bent or drawn parts in layout problems

These examples are some of the numerous layouts to be found in everyday use, and as these are but typical of millions of similar ones, no detailed explanation or discussion will be given. The assortment of blanks might be for flat, bent, or drawn parts, and in case of bending the blank it might, in some cases, necessitate changing the layout to take advantage of the grain of the material in relation to the bend, as was mentioned in a previous article of this series.

Many of the blanks are arranged to overlap each other and when this can be done, a worthwhile saving in raw material is the usual result. It is always preferable in the overlap layout to place the blanks in one uniform direction in the strip stock, as this arrangement will allow the material to be fed through the press from one side only and in this manner the blanking of the entire strip may be accomplished without the necessity of re-running the stock. In some cases, such as the layout for triangular parts, it is necessary to arrange the blanks as shown to effect a saving in raw material and in this case the stock may be run through the press in one direction, then re-run from the opposite side, or the die may be constructed to take care of both blanks in one operation. The latter method, where a much more costly die is required, will save a great deal of labor as compared to the first mentioned system. However, this is a point which must be decided by the merits of each individual case, for if the production schedule warrants the expense of the more complicated die and the saving in labor is sufficient to pay for this expense, it will prove to be the better method.

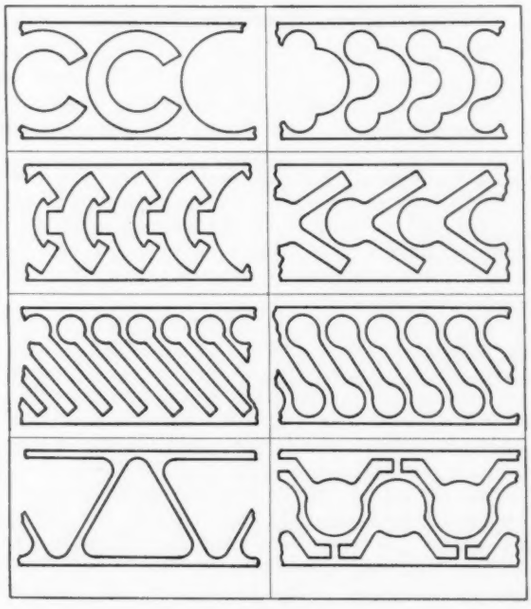


Figure 2

In the case of bending, the assortment of blanks might have to be changed to take advantage of the direction of grain in the metal

A very important item which is often considered in lay-

out work is the fact that one kind, temper, width and thickness of stock may be adaptable to the economic production of many different parts. This fact makes practical the purchase of stock in fewer sizes, which will allow a saving in price, a more flexible raw material stock and a smaller unfinished stock inventory, all of which are in line with proper standardization.

In the practice of this method, a slight difference in the arrangement of blanks will perhaps be found necessary and this change should, of course, be made wherever it is found practical, but in some cases its use might mean a prohibitive loss of stock and such conditions must be regulated to suit the particular conditions existing in each separate manufacturing problem.

In some cases, the scrap material left from the blanking of large parts with large openings will be sufficient to make another piece, in cases of this kind it will be found practical to incorporate both blanks in the same die. In this manner the scrap material, which would ordinarily have to be re-run or disposed of in some other way, is used to produce a part at practically no expense, and the saving effected by taking advantage of this condition wherever it is found practical will always amount to a very satisfactory figure.

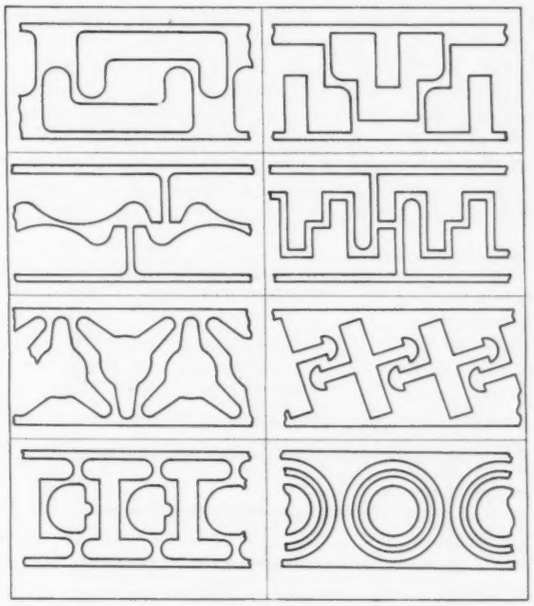


Figure 3

Many blanks are arranged to overlap each other, and when this can be done, a worth-while saving in material usually results

In material layouts for parts of extremely small size, care should be exercised in using the widest stock possible without prohibitive waste. This may be accomplished by laying the blanks at nearly a right angle, or, in some cases, at right angles to the edge of the stock in order to use material of sufficient width to prevent buckling, twisting, and the numerous other difficulties of handling which are common to the smaller sizes of ribbon stock.

In figuring layouts, another feature must be considered. This feature is the schedule of manufacture for the finished product in which the part is used and from this source the requirements such as quantity demand per year and time allowed for production may be obtained.

For instance, a device is made which uses a small, plain washer and we find that ten thousand pieces per year are to be made. In this case, where only a small number are to be made, this part would be laid out in a single strip, as shown in Figure 4, and blanked in a compound die at the rate of one part per down stroke of the press.

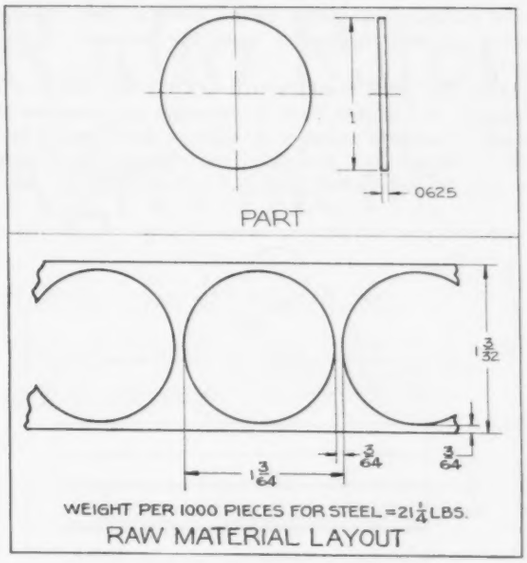


Figure 4

Where only a small number of parts are to be made, the part should be laid out in a single strip and blanked in a compound die at the rate of one part per down stroke of the press

Supposing the manufacturing schedule for this device was increased to such an extent that one million washers would be required. In this case a progressive die would be used. This die would blank and pierce many parts at each stroke of the press. In Figure 5 a material layout for eight parts at a time is shown.

This layout represents a saving in raw material over the single strip method, however, the expense of the progressive die would be prohibitive to small scale production. In this simple example it may be seen that the number of parts required is one of the determining factors of the layout.

The example of the washer is typical of any blanked part and the conditions governing it's production are, of course, applicable to other parts. However, many times there are other conditions, such as punch press and tool equipment which might possibly make the part too expensive to manufacture that it would be good practice to have one of the

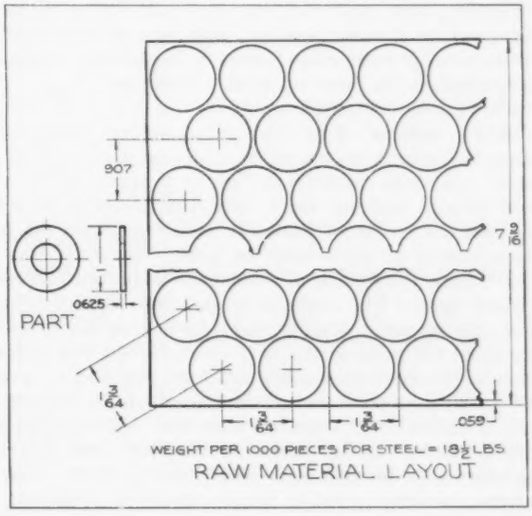


Figure 5

When one million washers of the type shown in Figure 4 are needed annually, a progressive die would be used so that the die would blank and pierce many parts at each stroke of the press

many stamping companies do this work as they are specialized to a high degree to meet the present competitive markets.

There are some blanks which will not lay out in a strip efficiently and in such cases a thorough and complete effort should be made to redesign the part so that it might lay out more economically. However, the efficient functioning of the part should not be sacrificed to any extent as the cost

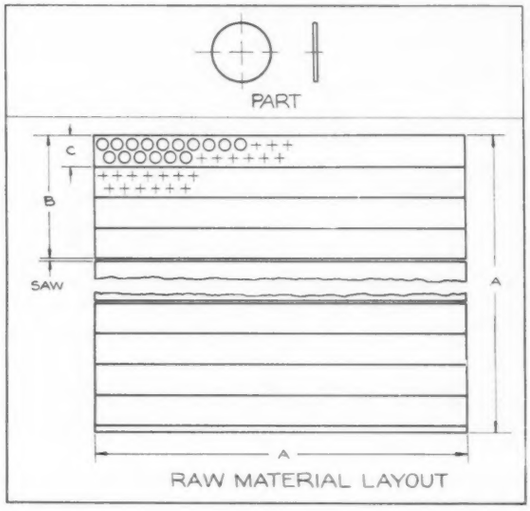


Figure 6

A double row of parts was found to be most economical with this round part. The sheet was divided into strips by sawing and these sheared into strips the right size for two rows of parts

of raw material is, in most cases, low enough to allow strength and proper function of parts. Much ingenuity can be used in adapting various shaped blanks to strips and in such a large and varied field there will be a great number of opportunities to exercise great skill and patience in planning the most economical layouts.

In the foregoing paragraphs we have been discussing metal stampings only and, in many of the present-day devices, various other materials such as bakelite, fibre, etc., are used for electrical insulation and numerous other purposes.

Bakelite, fibre, and other materials of similar characteristics may be sheared, punched, blanked and machined in a manner similar to metals. However, in planning layouts for stamped parts in these materials, there are a few things which must be remembered.

Taking bakelite sheet for an example; this material cannot be bought in rolls and to divide the standard size sheets into strips suitable for use in a punch press in the most efficient manner, much care and forethought should be given the layout of blanks in order to obtain the maximum number of parts from the sheet.

In Figure 6 we have a round part to be blanked out in a punch press. The problem in this case is to divide the sheet into strips of suitable sizes for use in the press. In laying out the parts in the strip it was found that a double row was the most economical and with this fact as a basis we find that in order to provide strips of the proper size from a standard size sheet we must first divide it into four equal parts by sawing. Each of the four strips of equal size must now be split into four equal parts by shearing and the resulting strips be found correct in width for the required double row of parts.

The first division of the sheet is made by sawing, owing to the difficulty in handling the large sheet in the shear, and at this time it should be noted that an allowance must be made for the waste material in the saw slots.

The determining factor in the arrangement of strips to be taken from the sheet is the quantity of parts to be made. For example, providing the part was to be made in very small quantities, thus making the cost of the double row die prohibitive, the part would be laid out in a single row which would of course necessitate a different arrangement of strips in the sheet due to the smaller strip required.

In a part layout such as we have pictured in Figure 6, using bakelite as material, the factor for material waste between parts and between parts and edge must be made larger than is customary in metal. In most cases the allowance is taken as one and one half times stock thickness and very satisfactory results are obtained in this manner.

Much can be accomplished in cutting down waste material in layout blanks for strips of insulating material to be cut from standard sheets providing a little time is spent in deciding just how the job may be done most efficiently. Some concerns make up their layouts and order the raw material in sheets cut to a size which will accommodate the particular work they are doing, however, this procedure is generally more costly owing to the higher price of raw material cut to specifications.

In some cases it might be found advisable to purchase strips cut to accurate dimensions which would give the required blank by merely using a simple cut-off operation. In other cases it might be found that owing to the type of equipment at hand for cutting the raw material, blanks could be purchased cut to size cheaper than it could be done at the purchasers' plant from the raw material.

In Figure 7 is shown a layout for panels to be cut from insulating material purchased in standard size commercial sheets. This layout will of course differ from that of

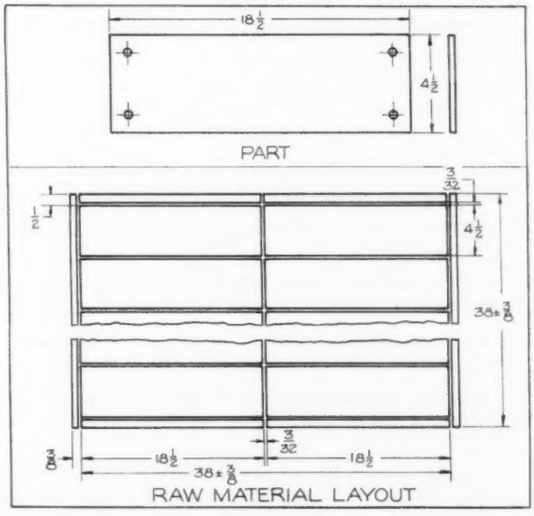


Figure 7

In this layout of a panel, to be cut from insulating material purchased in standard size sheets, the arrangement of parts is different from that of metal parts, because the blanks are obtained by sawing the sheet instead of shearing

metal parts due to the fact that the blanks are obtained by sawing the sheet instead of shearing as is usually done with metal.

In the layout as shown, a 38 x 38 commercial sheet is found to be correct for sixteen blanks and in dividing this sheet an allowance is made from the starting side to insure a clean edge on the blank.

The allowance is shown on the top and left sides of the sheet and is figured in such a way that there will always be a scrap strip left from the minimum size of the sheet, both in length and in width.

The R. M. A. Radio Patent Interchange Agreement

An outline of the pertinent factors entering into the classification of patents relating to radio apparatus for interchangeable licensing

LE ROI J. WILLIAMS*
Chairman, Patent Committee, Radio Manufacturers Association

CROSS licensing is not a new venture. It has been noticeably successful for fifteen years in the automobile industry and also among manufacturers of aircraft. It has been possible for us to follow literally the documents of either of these industries except in general principles for our situation is somewhat different.

In the automobile industry, for instance, all of the members of their association were engaged solely in the manufacture of complete automobiles. None were engaged in the manufacture of parts only, nor in manufacturing activities unrelated to the building of automobiles.

Therefore, the cross-licensing agreement of the automobile industry covered all of the patents of the subscribers excepting those covering inventions involving a radical departure from the existing art.

The membership of the Radio Manufacturers' Association involves a variety of activities. Some are engaged solely in the manufacture of complete radio sets. Others are engaged solely in the manufacture of radio parts. Some may be engaged in the manufacture of complete sets and parts. Others may be engaged in either one of these activities and also in manufacturing or selling activities in the electrical art but unrelated to the radio art.

It was the intention that the cross-licensing agreement of the Radio Manufacturers' Association should cover only the manufacture and sale of radio devices and parts therefor, and to have no effect on the other activities of those adopting the agreement. Therefore, the agreement opens with a statement of the purposes of the document, which are to avoid "the possibility of patent litigation between them over patents on or relating to radio devices, electric phonographs, group address systems and/or to parts and accessories therefor."

Then follows a group of definitions. On Page 2 appears a definition of "radio devices" as follows:

(a) devices useful only for "radio purposes" and

(b) devices especially adapted for "radio purposes" but capable of other uses except where the same are sold, licensed only for uses other than "radio purposes" in which cases the same are not to be regarded as radio devices hereunder.

On Page 1, paragraph 3, there appears the following definition of "radio purposes":

(a) The transmission and/or reception by radio and/or by wire of news, music, pictures, speeches, sermons, advertising, entertainment, educational and/or similar matter and/or any of them and/or combinations of any of them only for the purposes of exhibition, entertainment and/or general instruction or education.

(b) The electrical amplification of electrical energy for use in group address systems, phonographs, and/or for the purposes set forth in sub-division (a) of paragraph (3) of this Article.

(c) The adaptation of electric energy from electric light, heat, power, or traction lines and thereby supplying local energy to the elements, or any of them, of electron discharge tubes and similar devices for the purposes set forth in paragraphs 3, 4, 5, 6 and 7 of this Article. Thus, there is a difference between "radio devices" and "radio purposes."

It will be observed from the foregoing definitions that a "radio device," which is the subject of the cross-licensing agreement, is one (including amplifiers and socket power devices for use with radio devices) that is especially adapted or useful for transmission or reception, either by radio or wire, of program or news material which is seen or heard "but only for the purposes of exhibition, entertainment and/or general instruction or education." It will be observed that the definition of radio devices does not include transmission and reception of power, nor commercial communication either by wire or radio. Radio devices as defined, are limited to what is generally recognized as the program or entertainment field by wire or radio.

As has been observed, there has been included within the scope of the cross-licensing agreement, group address systems and phonographs because of their similarity in charac-

UNDOUBTEDLY the cross licensing agreement entered into by automobile manufacturers some fifteen years ago has done more for that industry than any other thing. By the same token it is anticipated that the cross licensing of radio patents will have the same stimulating effect on the manufacture of radio and related radio apparatus. With this in view the Radio Manufacturers' Association has formulated an agreement in which various patents relating to radio have been classified for licensing interchangeably among those making radio equipment. THE EDITOR.

Abstracted from an article by Le Roi J. Williams, published in *The R.M.A. News.*

ter to radio devices. These are defined as follows in paragraphs 5 and 6 on Page 2:

(5.) Group address systems means the combination of

(a) Means for receiving and translating sound energy into electrical energy.

(b) Means for the electrical amplification of electrical energy and

(c) Means for converting electrical energy into sound energy.

(6.) Phonographs means all apparatus for the reproduction of intelligence from records in motion.

Definitions of Classes of Patents

THE patents which are the subject of the agreement are so-called radio patents, which according to the definition in Paragraph 8 of Page 2 means:

"all Letters Patent (or claims thereof) of the United States, covering inventions used in, or in connection with radio devices, electrical phonographs and group address systems, except (a) design patents and (b) patents on raw materials and/or (c) any patents so far as the claims thereof cover inventions not applicable to, nor relating to radio devices, electrical phonographs and group address systems."

Then follows paragraphs 9 and 10 on the same page, with definitions of what are referred to as Class A Radio Patents and Class B Radio Patents, respectively.

Class B Radio Patents which are the only patents under which cross-licenses are granted, are briefly defined as all radio patents not included within the definition of Class A Radio Patents. Therefore, it is of interest to observe the following definitions of what constitute the radio patents which are excluded from the operation of a cross-license agreement, namely: What are Class A Radio Patents? The contract defines them as follows:

"A Class A Radio Patent means any of the 'Radio Patents' (or claims thereof) now or hereafter issued, of or under which the 'Subscriber' may now have, or hereafter acquire, ownership or control, or the right to grant, licenses or shop rights, to the extent of any claim or claims thereof, covering an invention which, in the opinion of the Board of Directors of the 'Association,' expressed in a resolution duly adopted at a regular or special meeting duly called, at which a quorum thereof was present and participated, or in case of appeal as hereinafter provided, in the opinion of the arbitrators appointed hereunder, is of an outstanding character, or the result of an inventive effort of a high order; rather than a mere improvement, variation, modification, or natural development of the existing art, resulting from an ordinary effort of the inventive faculty; provided (1) that such patent is duly reported to the 'Association' within the time and in the manner hereinafter provided, with a written request for the classification thereof as a Class A patent, accompanied by the affidavits hereinafter provided for; but any delay in the fulfillment of this last proviso may be expressly waived in writing by the 'Association,' provided such waiver is given with full knowledge of the material facts; and provided, (2) as to patents in which the 'Subscriber' may acquire ownership or control or the right to grant licenses or shop rights thereunder after March 1, 1928, that such invention is developed within the 'Subscriber's' organization, that is to say, is devised and worked out by one or more agents or servants (including officers) of the 'Subscriber,' while employed in or about the 'Subscriber's' business."

The idea of excluding from the operation of the cross-licensing agreement a group of patents (known in this agreement as Class A Radio patents) covering inventions

"of an outstanding character, or the result of an inventive effort of a high order; rather than a mere improvement, variation, modification, or natural development of the existing art, resulting from an ordinary effort of the inventive faculty";

is closely patterned after, but is more liberal than a similar provision of the automobile cross-licensing agreement.

During almost fifteen years of operation under the automobile cross-licensing agreement, so far as is known, no patent in the automobile industry has been so classified as to be excluded from the operation of the agreement. It should be observed, however, that the automobile cross-licensing agreement provided that in order for a patent to be so classified, it must cover an invention involving a *radical departure* from the existing art.

This is a higher standard than in the radio agreement. Another substantial difference between the automobile provision and the radio provision, is, that the former has a requirement that in order for patents to be excluded from the operation of the agreement they must cover inventions developed within or by a Subscriber's organization. The radio provision requirement of this character applies only to inventions acquired or controlled after March 1, 1928.

It will be observed that the radio provision covering Class A Radio Patents is more liberal in favor of so classifying unusual inventions than is the automobile cross-licensing agreement. This is in accordance with the recommendation of one of the high officers of the National Automobile Chamber of Commerce.

Radio patents will be classified as Class A by the Board of Directors of the Association after proper hearings. In case of a decision unfavorable to the owner of the patent, an appeal is provided for to an arbitration board consisting of one appointed by the Association, one by the Subscriber, and the third to be chosen by the Subscriber from a list of not less than three disinterested persons submitted by the Association.

Paragraph B of Article II, Page 3 of the contract, provides that no subscriber will be required to grant a free license when it would violate "the legal or equitable rights of any other person, firm or corporation." In other words, when a subscriber is required to pay royalties to others under any of his patents, such a patent would not be the subject of a royalty free grant under this agreement.

Application of Cross-Licensing Agreement

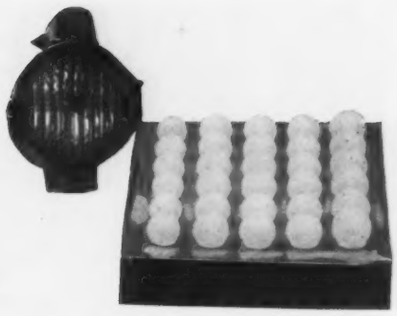
PARAGRAPH D1 of Article II provides that the cross-license applies only for use

"in radio devices, electrical phonographs and/or group address systems, and/or parts and accessories therefor, and that when licensed parts and accessories which are manufactured thereunder are adapted for uses other than in radio devices or for use in electrical phonographs and/or group address systems, the license to sell shall be limited to sale for use only in radio devices, electrical phonographs and/or group address systems, and for sale only to manufacturers of radio devices, electrical phonographs and/or group address systems, and likewise to jobbers, dealers and the retail trade."

The foregoing provision means that when parts or accessories which might be used in radio devices, phonographs and group address systems are also adapted for use in devices unrelated to radio, they do not carry a license when sold for employment in such other devices. It also provides that when parts, as such, are sold for use in radio devices, electrical phonographs and/or group address systems, that such *parts* are licensed only when sold to cross-licensed manufacturers of radio devices, electrical phonographs and/or group address systems, or to jobbers, dealers and the retail trade. The purpose of this provision, of course, is to protect Subscribers in their respective patent rights in activities unrelated to radio.

(*Continued on page* 70)

GLASS and Its Electrical Uses



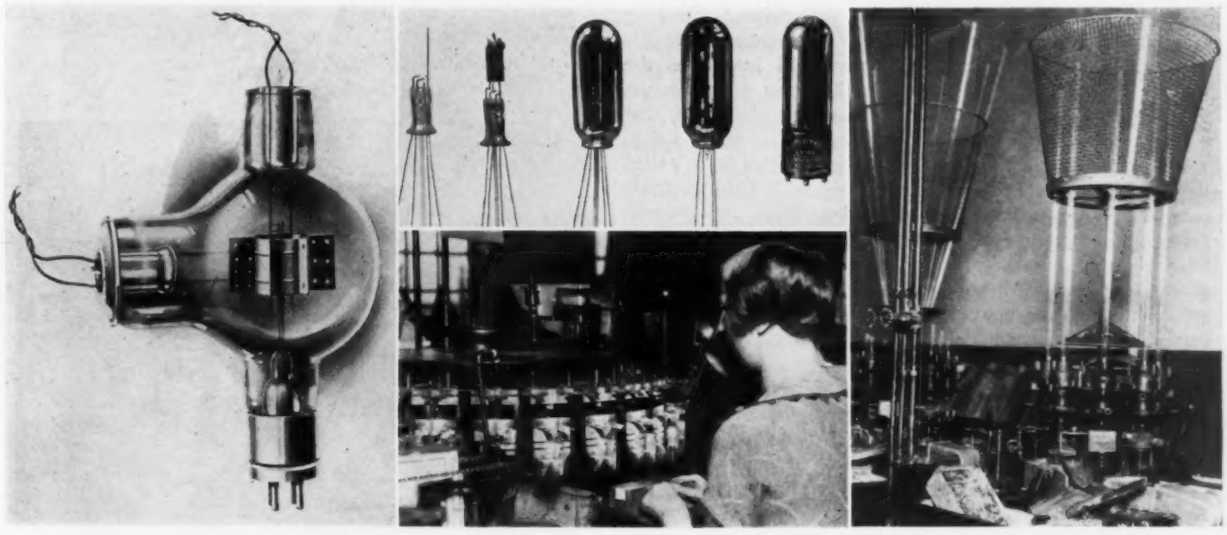
By William Crawford Hirsch

No. 12 of a Series of Articles on Common Materials

Glass is used in a widely scattered list of electrical products, ranging from flashlight lenses to battery and spraying outfit jars

LONG before the birth of the electrical industry experimenters in the realm of frictional phenomena visioned glass as an indispensable material in creating electrical energy, polished glass furnishing the positive and rough glass the negative in their mental picture of generating electricity. If the development of dynamic electricity has played havoc with the dreams of these early investigators, it has in no wise affected the importance of glass as an electrical material. In fact, electrical uses of glass have multiplied impressively in the last few years. Long in use as an insulator for pole line distribution of electrical energy for low voltages, recent progress in the technique of glass manufacture has resulted in placing on the market insulators that will give satisfaction in operating voltages up to 50,000 volts. Perhaps the greatest impetus to research by glass technologists with a view to broadening the use of their product in the electrical industry has been the consumption of glass in radio receiving sets. The current rate of consumption of radio tubes is estimated at 100,000,000 a year. Production of incandescent lamps is mounting by leaps and bounds. In the lighting fixture field, glass not only finds more and more employment in domes and shades, but also in decorative ornaments. A very large outlet in the aggregate for glass is found in a widely scattered list of electrical uses, ranging from flashlight lenses to electrical refrigerator fronts and from electrodes for electro-therapeutic appliances to battery and spraying outfit jars.

Glass is a generic designation for a class of products, the mineral constituents of which are fused by heat. All commercial glasses have sand as their chief ingredient. The silica content of the sand determines to a marked degree the quality of the finished glass, and for that reason the highest possible degree of purity is exacted from sand. Some quartz rock formations yield a sand that contains from 98 to 99 per cent silica, but deposits as pure as these



Courtesy of Radio Corp. of America and Westinghouse Lamp Co.

Vacuum tubes consume much of the glass utilized in the electrical industry. An amateur transmitting tube, shown at the left, illustrates the use of glass in that particular line. In the above central view is the story of glass consumption in radio tubes. The machine in the lower central portion is a glass stem-fitting machine. The machine at the right shows how hot cut flares are made for the basic structure of radio tubes. The rate of consumption of radio tubes is estimated at 100,000,000 a year

Courtesy of Whitall Tatum Co.

Long in use as an insulator for pole line distribution of electrical energy for low voltages, progress in glass manufacture has developed insulators which can be used in operating up to 50,000 *volts*

are not too plentiful. The impurity against which glass manufacturers are always on guard is iron, and more than a trace of this element is frowned upon in glass sand. Uniformity of grain size is another important factor. Glass sand is carefully washed and usually graded. West Virginia, Illinois, Pennsylvania and New Jersey are the chief sources of supply for glass sand.

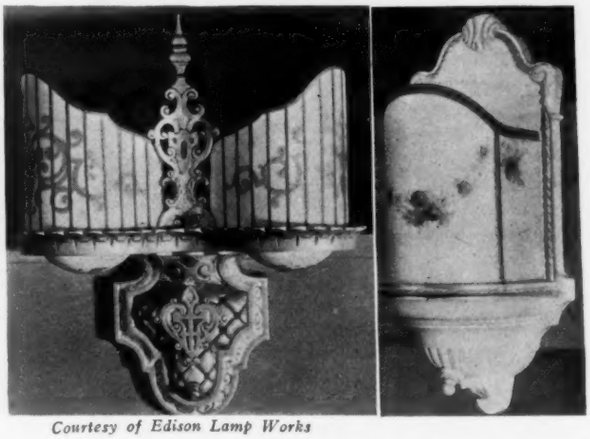
Next in importance as a glass-making raw material is soda ash, salt cake being used in the manufacture of some glasses as an alternative source of sodium carbonate. Lime in suitable quantities is introduced into most glasses with a view principally to hardening the product, either burned lime or limestone being used. Other raw materials used in glass-making vary largely according to the product. Coal is introduced into plate and sheet glass mixtures in powdered form as a reducing agent. Feldspar is widely used in the production of illuminating glassware, the alumina content of that mineral being considered beneficial to the tensile strength of the glass. Fluorspar is used as a flux to improve transparency and brightness. Cryolite, mined in Greenland, finds wide employment in illuminating-ware because it tends to eliminate red rays and intensifies the opacity of opal glass. Barium, in the form of carbonate, furnishes an important property to lighting glassware, that of heat resistance, and also increases brilliance of finish. Lead, frequently in the form of sublimed litharge, is called upon to contribute chiefly refractoriness. This explains why cut glass is usually a so-called lead glass. Zinc oxide plays an important rôle in glasses that are called upon to undergo sudden temperature changes. Borax comes in for extensive use as a heat-resisting agent in glass mixtures, enhancing also the optical properties and the durability of certain glasses. Arsenic is used in some glasses as a decolorizing medium.

The foregoing list of glass-making raw materials is by no means complete, but merely names the most important. Each has its definite mission in the production of special purpose glasses and the quality of these depends to a large extent upon the batch formula properly interpreting the demands made upon the finished product and the close control of raw materials as to chemical purity and physical uniformity. To these raw materials must be added a long list of coloring agents that are available to the glass technologist, running the gamut from precious gold and silver to humble iron. These metallic salts find employment both in the batch as well as in decorative effects that are superimposed on art glassware. A gold-tin precipitate, known as purple of cassius, and nitrate or carbonate of silver furnish very popular colors. Cobalt, chromium, copper, cadmium, manganese, selenium, uranium are a few of the metallic substances that are used to impart color to glasses. By skillfully blending them an unlimited range of shades and nuances is made available. Tin and antimony are also used, the latter in conjunction with other opacifying agents in the production of opal glass.

The raw materials that constitute the glass batch are fused in a furnace. There are two types of furnaces—pot furnaces and tank furnaces. In the former the glass is melted in pots or crucibles, while in the latter melting proceeds in the tank itself. Glass tanks range from so-called day tanks, which can be operated intermittently and are adapted to the production of specialties, to tanks with a capacity of 100 tons per day with innumerable mechanical refinements. In the picturesque language of the glass industry, the part of the tank where the raw materials are received before they enter the melting chamber proper is known as the "dog-house." Tanks may have either a single or a double "dog-house." Whether the batch is melted in a pot or tank furnace, depends entirely upon the character of the ware and the quantities involved. The frequently encountered statement that cheap glassware is made in tanks and high-grade ware in pot furnaces is one of those glittering generalities that have altogether too many exceptions to justify their being accepted as the rule.

From the melting furnace the mass emerges ready for whatever shaping process it is to undergo. This may take the form of blowing, pressing, rolling or drawing, the latter being in part a blowing process used in the manufacture of small-diameter tubing. The mechanical replacement of many of the traditional manual operations of the glassmakers' craft is not only responsible for the obsolescence of much equipment, but also for that much of the trade's nomenclature. In fact, mechanical developments within the last few years have played havoc with some of the orthodox definitions for important processes and products. The latest method for drawing flat sheets of glass vertically from the tank, by what is known as the Fourcault process, has so much in common with the rolling of plate glass, so far as the properties of the finished product are concerned, that, aside from the polish that is given to plate glass before it is marketed, the boundary lines between the two divisions of flat glass have become very narrow.

In "hand-blowing," which continues to some extent by



Courtesy of Edison Lamp Works

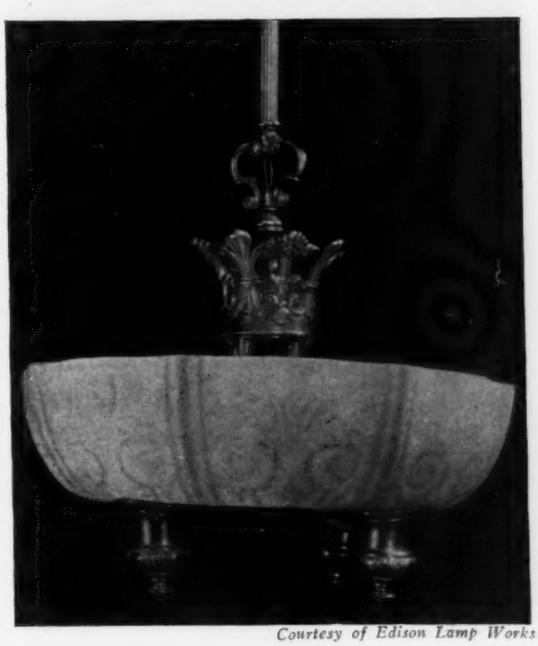
Dense yellowish opal glass is used about the lamps of the semi-direct wall unit illustrated at the left and as a small reflector under each lamp. A decorative glass shield is employed in the semi-indirect wall bracket shown at the right

the side of machine-blowing, the glass blower gathers the mass from the tank on the blow-pipe and rolls it over the marver, a flat stone, thereby forming it into a somewhat regular and solid shape. Blowing into his pipe, he extends it into a bulbous mass, known as a parison. Deftly he rolls the parison on the marver, shaping it to the desired form. The blow-pipe is removed from the shaped piece which is then placed in a parison mold, annealing in a so-called lehr, a heated compartment through which the ware travels, following for the purpose of removing strains.

From this very much condensed description of the method of "hand-blowing" it must not be assumed that any of the mass products used in the electrical industry, such as incandescent lamps and radio tubes, are made by so primitive a procedure. Special machines have been perfected for these and they are really self-contained automatic units, molten glass being supplied in a steady stream to the molds from which the lamps and tubes travel into and out of annealing chambers. The mechanical blowing of glass cannot be said, however, to have done away with the more or less manual shaping of numerous glass products that find use in the electrical industry. These products are fashioned from glass tubing. The latter is automatically blown on a machine that draws the glass from the pot, but the secondary products are obtained with the aid of the blow-pipe, the tubing being reheated and then fashioned into such shapes as miniature lamps and glass letters for signs.

A good deal of hollow glass is pressed instead of blown. The feature of the pressing process is the forcing of a layer of glass into contact with a mold by the pressure of a mechanically-actuated plunger. Some of these automatic presses accommodate eight molds around a circular table which the plunger traverses as the table rotates, a feeding device filling the molds before the descent of the plunger.

Formerly all sheet glass was drawn in the form of cylinders which were then flattened and annealed. The Fourcault process has done away with this, the sheets being drawn flat from the tank. More and more of the sheet glass plants, not only in the United States but in other glass-producing countries, are being mechanized, and hand-production of sheet glass will soon be a thing of the past. Relieved of much of its former cumbersome production



Courtesy of Edison Lamp Works

This semi-indirect unit employs glass in a design which is a departure from the conventional type. In this unit the glass is formed in a continuous ring-shaped reflector, which contains four lamps

Courtesy of Edison Lamp Works

An attractive lighting unit of the semi-indirect type for residential use is made of glass formed in an acanthus leaf design

methods the sheet glass industry has within the last few years been able to devote its energy toward the development of quality products. Aside from the fact that ultra-violet and infra-red light waves are being studied with a view to embodying in glass properties that will benefit health, the important feature from the electrical manufacturer's viewpoint is that glass manufacturers are today anxious to supply a product uniform in transparency, freedom from blemishes, and of one and the same thickness, matters of the greatest importance in instrument dials.

A relatively recent development is the introduction of the so-called continuous process in the manufacture of plate glass. This provides continuous operation from the time the molten glass leaves the tank at 2000 deg. Fahr. to the smoothing and polishing of both sides of the plate.

The use of glass, clear and silvered or otherwise, ornamented, in lighting fixtures has increased considerably in the last few years. The modernistic tendency has created a wide market for panels. Ornamentations are provided by smoothing and polishing of corners, beveling, cutting, embossing, and numerous other decorative processes.

Vitrified silica, while not strictly speaking a glass, possesses great thermal endurance, and both in the transparent and milky form, finds employment in some electrical uses, especially in the form of lenses in connection with ultra-violet ray apparatus.

The manufacturer of a proprietary line of glassware lists the following properties for his products:

Dielectric Strength—35 Kv. per 100 mil. thickness.
Dielectric Constant—4.48 (30,000 cycles).
Phase Angle Difference—0.160 (30,000 cycles).
Power Factor—0.28 per cent (30,000 cycles).
Electrical Resistivity (Volume)—Greater than 1014 ohm-c. c.
Electrical Resistivity (Surface)—At 34 per cent humidity, 1014 ohms; at 84 per cent humidity, 14 x 108 ohms.

It has been previously shown that batch ingredients have a vital bearing on electrical, thermal, and mechanical properties of glass. Of probably just as marked influence on the properties of the glass is the annealing process to which the glass is subjected after it has been shaped, especially so on heat resistance.

Progress in Generator Design and Practice

*Great changes have been made in the construction of electrical equipment in the past few years, due to developments in the art of cutting and welding**

IN a series of statements prepared by representative manufacturers of electric generators in which developments in their construction were described the Allis-Chalmers Manufacturing Company says in part that during the past year there has been built a number of generators and motors having parts such as stator yokes, bases, rotor spiders, and bearing pedestals for roller bearings constructed of electrically-welded steel parts. There is at present under construction a 25,000-kw., 143-r.p.m. horizontal waterwheel generator, whose stator yoke will be electrically welded throughout. This yoke will have an outside diameter of 26 ft. and will weigh approximately 58,000 lb.

The accompanying article, which is presented in three installments and in the form of statements by representative manufacturers, is intended to show developments in the construction of generators for the year 1927-1928, which were made possible by developments in the art of cutting and welding

Experience so far with welded frames and bases has been quite satisfactory, there being a considerable saving in pattern work and pattern storage, and it is expected that the use of this type of construction will undoubtedly become very general. Although the frames made from structural shape and steel plate have ample strength, there is danger, if care is not taken in the design, that sufficient stiffness and rigidity will not be obtained. In fact, cast iron has definite advantages from the point of view of rigidity, but there is no reason why welded frames cannot be so designed and braced that they will be equally good in this respect. Examples of the new type of construction are illustrated in Figures 1 and 2.

Generators with One Guide Bearing

DURING the past year there have been completed and put into operation three large hydroelectric generators, which are of interest in respect to their mechanical design. They are believed to be the largest machines in operation of the so-called umbrella type. Two of these machines are rated at 27,500 kv-a. and 90 r.p.m., and one is rated at 22,500 kv-a. and 75 r.p.m. These machines have only one guide bearing each, and both the thrust bearing and the guide bearing are mounted under the rotor. There being no upper bridge, the whole weight of the rotating parts is carried by the spider under the generator.

Generators of this type are specially suitable for semi-outdoor power stations, and it is possible, by mounting the generators outdoors and covering them with sheet-steel enclosures, materially to reduce the cost of the power house. With this design it is also possible readily to obtain access to the stator winding merely by lifting the rotor off the shaft, with the bearings and other parts left in place. These machines operate fully as well mechanically as those of the conventional double-guide-bearing design.

The single-guide-bearing design is best adapted for large moderate-speed units, which have rotors of large diameter. The design, however, is not suited to large high-speed generators, which have rotors of relatively small diameter and considerable axial length, since it is not possible to place the guide bearing sufficiently high to keep the overhang of the rotor with respect to the bearing within safe limits, and at the same time to have the thrust bearing in a readily accessible location.

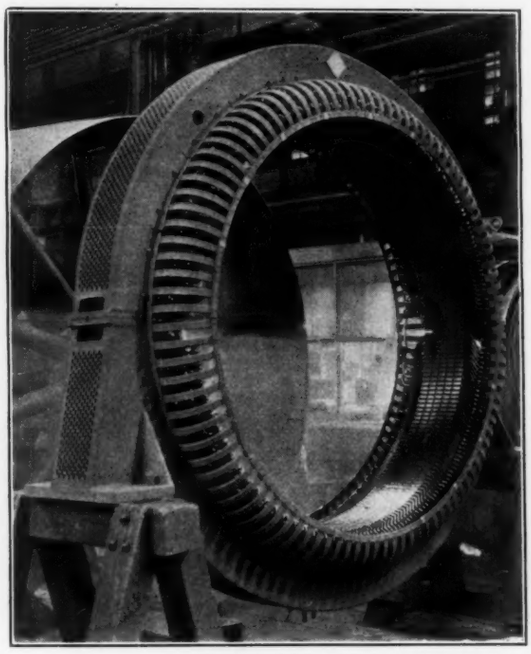


Figure 1

A split welded-steel yoke for a 1100-*hp. Allis-Chalmers synchronous motor that was constructed for the West Penn Cement Company, which shows recent developments in frame construction*

*Abstracted from a report of the Electrical Apparatus Committee of the National Electric Light Association, as prepared for the year 1927-1928, under the auspices of its Generating Stations Subcommittee.

In large generators, and particularly in those operating at 6600 and higher voltages, "Class B" (mica) insulation is recommended for the stator coils, even if the operating temperature is within the limit for "Class A" (fabric) insulation. The longer life of the mica insulation and its ability to resist damage from corona make it desirable in large units regardless of temperature. Extensive tests have shown that an asphaltum-base varnish or binder is superior to shellac or linseed-oil varnish for stator coil insulation, and mica coils are now made with this type of varnish exclusively. Life tests have shown that the asphaltum-base material is not affected by corona to anywhere nearly the same extent as shellac, which, in the course of long-continued operation, is likely to disintegrate. Another advantage of the asphaltum material is that it retains its flexibility, not becoming as hard as shellac or linseed-oil varnishes.

Transposed Armature Conductors

GENERATORS have not been built for voltages higher than 15,000. So far as generators themselves are concerned, higher voltages are not desirable, but, in order to limit the current handled by oil circuit breakers, there has been a demand for higher voltages in machines of very large capacity. Such machines can be built, although, of course, thicker insulation is necessary, and less efficient utilization can be made of the slot space. It is also necessary to take special precautions as regards corona. It would seem that more consideration might be given, in attempting to limit the current handled, to subdividing the output from large units by using windings of more than one circuit per phase and thereby reducing the current by half or more.

During the past two years a number of machines have been built with transposed armature conductors. Such an arrangement is advantageous for large units, and also for smaller units wound for low voltage and high current. In large four-pole machines where only four parallel circuits are available the depth of conductor becomes so great that some form of transposition is desirable in order to reduce the eddy-current losses and heating, but it is not advisable to introduce the complication and expense of transposed conductors in the case of machines where the eddy-current loss can be kept within conservative limits by the use of multiple circuits, as can be done, for example, in most waterwheel generators. Another advantage of the transposed conductor is that it reduces the number of turns per coil and, therefore, the number of conductors per slot, thereby making the machine less liable to breakdown between turns.

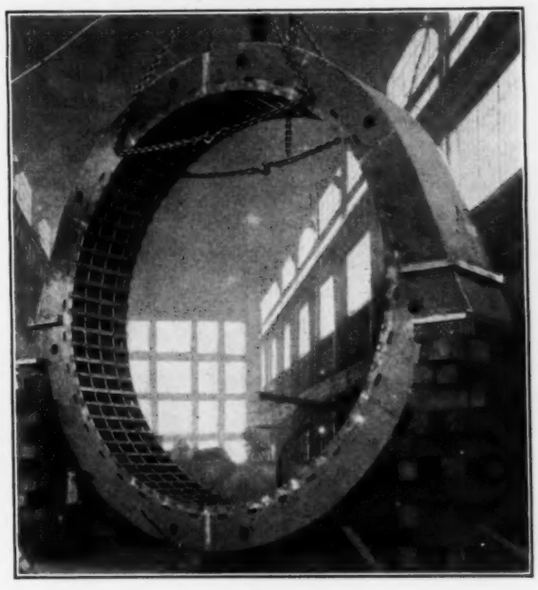


Figure 2

Another example of new construction methods in a welded plate yoke for a 25,000 kv-a. Allis-Chalmers waterwheel generator which was built for the city of Los Angeles

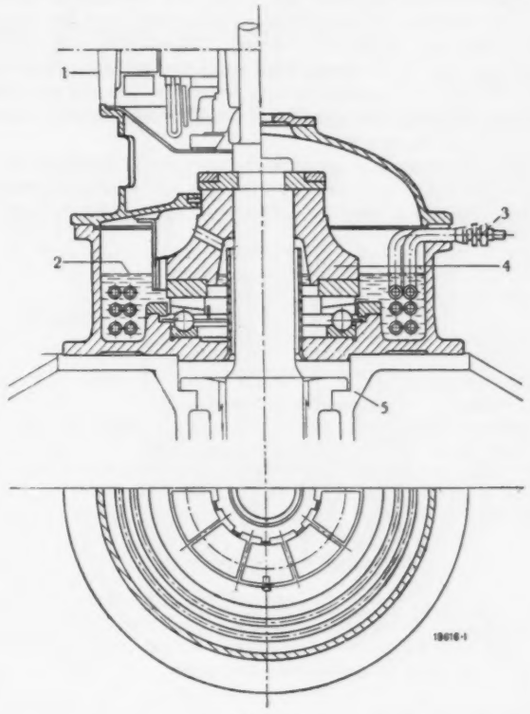


Figure 3

The Brown-Boveri segmental thrust bearing construction of the separately pivoted segment type, designed for operation at high speeds and to withstand thrusts up to 500 tons

As stated previously, large generators can, if desired, be built with divided circuits, thereby reducing the output of any one winding. Where such divided circuits are used, it is necessary to employ protective means to insure against overloading any one of the circuits in case of trouble.

The American Brown-Boveri Corporation states that up to the present time use has not been made of structural steel to any great extent.

In the effort to minimize capital outlay for power stations, the tendency is always toward larger units and higher speeds and the construction of alternators has been forced to keep pace with this progress.

Large Capacity Waterwheel Generators

RADICAL improvements in design have led to the development of high-speed, steam-driven turbo-generators of large capacity. A machine rated at 32,500 kv-a. and 3000 r.p.m. has been placed in operation, and two machines, each rated at 40,000 kv-a. and 3000 r.p.m., are now under construction.

Improvements have similarly led to the development of waterwheel generators of large capacity. Contrary to American practice, machines having horizontal shafts are often preferred to the vertical type in foreign countries. The largest single-phase alternators ever built of such low frequency as is sometimes required for railway work have been constructed for the Swiss Federal Railways and installed in the Barberine Power Station. These units are rated at 10,000 kv-a., 15,000 volts, 16 2/3 cycles per second and 333 r.p.m. Figure 4 shows that the stator of one of these machines is supported on rollers in such a manner that it may be easily rotated for inspection or repairs.

With respect to hydroelectric units with vertical shafts, one of the most important components is the thrust bearing, which has to carry the weight of the rotating parts of both alternator and turbine, together with the hydraulic thrust on the latter. Thrust bearings for this purpose are made of two types. For moderate loads and low speeds the design is suitable in which the running surfaces are of one piece and are spherically seated. For thrusts up to 500 tons and for high speeds the usual one-piece bearing surface is replaced by a number of separately pivoted segments. Such a bearing, for a pressure of 350 tons and 100 r.p.m., is shown in Figure 3.

The segments are supported somewhat eccentrically and, when the shaft is running, take up such a position that a wedge-shaped oil film forms between each segment and the surface of the thrust collar on the shaft. In this way contact of the surfaces is prevented and friction losses are made extremely small. The load is uniformly distributed between segments in a most effective manner by means of steel balls, as is also shown in Figure 3. The lower bearing bracket is provided with supporting bolts, upon which the rotor can rest after it has been raised for inspection or repairs. Several different designs have proved that bearings of this type are completely reliable under the most unfavorable conditions, even at speeds as low as those which occur during starting and slowing down.

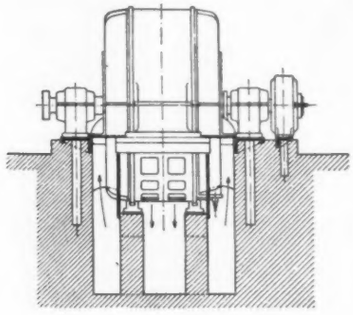


Figure 4

A three-phase Brown-Boveri alternator with a movable stator, showing how the stator is supported on rollers so that it may be revolved to facilitate inspection and repairs

Under certain conditions, such as when the speed of the waterwheels is low and direct-coupled generators would be too costly or too large, it may be advantageous to employ geared drives. Modern spur gearing is suitable in such cases for very high powers and large ratios, but the application of bevel gears in this respect is very limited. It is possible, for example, to drive a generator at 1000 r.p.m. from a turbine running at 100 r.p.m. As the cost of the gearing is considerable, it must be carefully investigated in every case whether geared drive or direct coupling is the most advantageous. It has generally been found that gearing should be employed when the output exceeds 1000 to 2000 kw., and the turbine speed is as low as 80 to 100 r.p.m.

Developments in Insulation

THE insulation used is the result of research and experience extending over many years, and insures the production of coils capable of meeting the strictest requirements, both electrically and mechanically. The impregnation process in particular prevents the ingress of all air and moisture, and thereby eliminates all danger of the formation of ozone. The solidarity obtained by the impregnation and pressing processes obviates any tendency of the individual conductors to become loose and consequently to vibrate.

The final layer of insulation consists of a micanite sheath on the straight portions and several wrappings of varnished tape on the coil heads. The former is made up of micafolium, a thick, tough paper faced with flakes of mica. Shellac is used only for the micafolium wrapper, the impregnation of the coil before the wrapper is put on being done with a bitumen-base insulating compound. This compound is also used for impregnating the coil heads.

Insulation of this type is used on all steam-driven turbogenerators, except low-speed units of low voltage, which are provided with "Class A" insulation. It is recommended for continuous service at all temperature rises up to 75 deg. cent. above an ambient temperature of 40 deg. cent., and has proved to have a very long life.

A great deal of experience has been had in the building of high-voltage generator windings. As early as 1910 five three-phase generators, each rated at 3000 kv-a. and 17,600 volts, were built for the Bernese Power Supply Company of Switzerland, and are still in satisfactory operation. Numerous generators for this voltage have since been built, a noticeable example being the single-phase railway alternators previously referred to. These machines have been in operation since 1920 at 16,000 volts, with one pole permanently grounded, and are subjected to all the voltage surges coming in over the contact line, which is fed directly from the power station without intermediary transformers.

Developments in Bar Windings

IN the case of high-voltage windings, particularly when one pole is earthed, and in the case of windings designed for a test voltage of three or more times the rated voltage, unless precautionary measures are taken, it is inevitable that the air dielectric in the slight spaces remaining between the coil insulation and the slots will be overstressed and will consequently be the source of discharge effects. By way of remedy, the insulating sheath of the coil is provided with a coat of conducting varnish, shunting the air space between coil insulation and stator iron.

Conditions are particularly severe in the case of traction alternators, such as those previously mentioned, where, on account of the unfavorable flux distribution, discharges endangering the coil insulation are likely to occur at the edges and the corners of the teeth and the clamping plates in the neighborhood of the points where the conductors leave the iron. In order to prevent such discharges, the coils of the machines of this type are provided, at the points where they leave the core (Figure 5), with a narrow conducting sheath (c) of tin-foil, over which a sleeve of conducting

(*Continued on page 70*)

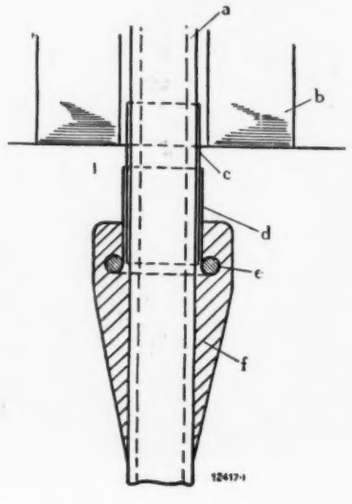


Figure 5

The construction employed for Corona-effect protection on a Brown-Boveri high tension alternator is shown at (c)

What's NEMA Doing?

A department covering activities of the divisions, committees and sections of the National Electrical Manufacturers Association

Phenomenal Increase Shown in Radio Tube Sales

In 1928 the retail sales of radio tubes totalled $110,000,000. This tremendous business directly reflects the value of the standardization work of the vacuum tube section of the National Electrical Manufacturers Association. Sales of tubes have maintained a steady and rapid rate of increase since 1919, when sales totalled only $300,000. In 1922 tube sales reached $6,000,000 and jumped to $17,000,000 the following year. The succeeding years' totals reached 36, 48, 58 and 67 millions in 1927. The last year's figure of $110,000,000 represents a much greater proportional sale of tubes due to lower average cost per tube.

Although there are more than eighty manufacturers of radio tubes in production today, the explicit definition of types of vacuum tubes contained in the Nema standards, which are published as part of the fourth edition of the Nema Handbook of Radio Standards, has protected the general public and greatly assisted the industry in sales development. The standards of that section include engineering definitions, vacuum tube bases, measurements, tube characteristics, rectifier tube base connections and rectifier tube characteristics. By the standardization thus fostered any purchaser can use any make of vacuum tube with any make of set.

The Nema vacuum tube section is functioning under the chairmanship of George Lewis of the Arcturus Radio Company.

Wiring Devices Groups Plan Divisional Set-Up

The attachment plug, snap switch, lamp receptacle and socket, fuse, and knife and enclosed switch sections unanimously voted at the January meeting in favor of the organization of a Wiring Devices Division to include these sections. C. L. Nicholson II, Pass & Seymour, Inc., was elected temporary chairman of the division, and O. H. Van Amburg, General Electric Company, temporary secretary, pending formal organization of the division at the time of the annual meeting, when it is expected the divisional set-up of the Association (based on the revised constitution and by-laws) will be definitely settled by the board of governors.

The various wiring devices sections at their January meetings appointed Trade Extension Committees to draft proposed trade practice rules of interest to their respective sections for submission to the member companies, with the understanding that if all sections in the Wiring Devices Division voted favorably on the question, a Federal Trade Practice Conference would be requested for the division as a whole. If a favorable agreement cannot be reached by the division, it was voted that the sections would proceed with rules applicable to their respective sections.

Instrument Standards Sponsored by Nema and A. I. E. E.

Nema has now been made joint sponsor with the American Institute of Electrical Engineers, for the development of standards on electrical measuring instruments. The following scope has been approved for that activity:

Definitions, classifications, rating, methods of test, construction details for A. C. and D. C. ammeters, voltmeters, wattmeters, reactive volt-ampere meters, power-factor, reactive-factor, phase-angle meters and synchroscopes, but not including curve drawing, contracting, low precision or special instruments.

Nema has also been made joint sponsor with the A. I. E. E. for the development of the standard on rolled threads for screw shells of electric sockets and lamp bases.

Conference Committee Selected by Carbon Arc Lamp Section

An industry conference committee on carbon arc lamps has been appointed by the chairman of the carbon arc lamp section, consisting of C. M. Graves, National Carbon Company; L. S. Kubiac, Photogenic Machine Company; M. J. Wohl, M. J. Wohl & Company. The Underwriters' Laboratories has appointed these men to serve also as the manufacturers' representatives on their industry conference.

At its February meeting the carbon arc lamp section voted unanimously in favor of requesting a Federal Trade Practice Conference, and appointed a committee consisting of C. W. Jameson, Atlas Electric Device Company; W. E. Doty, Sanitarium Equipment Company, and Paul E. Johnson, Paul E. Johnson, Inc., to submit definite rules for consideration at the next meeting of the section.

NEMA Events

Carbon Arc Lamp Section—April 12-13, Chase Hotel, St. Louis.

Casualty and Fire Prevention Committee.—April 16, 10 a. m., Nema office.

Welding Section.—April 17, 9 a. m., Union Club, Cleveland.

Standards Committee.—April 17, 10 a. m., Nema office.

Finance Committee of Nema.—April 18, 9:30 a. m., Nema office.

Industry Relations Committee.—April 18, 11 a. m., Nema office.

Transformer Section.—April 19, French Lick Springs, French Lick, Ind.

Executive Committee of Nema.—April 19, 10 a. m., Nema office.

Policies Division of Nema.—May 18 and 20, The Homestead, Hot Springs, Va.

Nema Spring Meeting.—Week of May 20, The Homestead, Hot Springs, Va.

Overhead Trolley Lines Section.—June 3, Montreal, Canada.

Carbon Section Will Invite Guests to Meetings

The carbon section recently held a very interesting meeting at the works of the General Electric Company, Schenectady, N. Y. The section has decided to supplement its regular meetings by an occasional guest or industry meeting, to which an invitation will be extended to the carbon specialty manufacturers and the brush cutter representatives, in order that they may be acquainted with the work the section is endeavoring to accomplish.

The section has nominated H. C. Mills, Morganite Brush Company, Inc., chairman; H. B. Eynon, Pure Carbon Company; P. R. Roberts, Le Carbone Company, as representatives of the section to serve on a joint sections committee of the motor and generator section on simplification and standardization of carbon brushes.

Breaker Scope Is Defined for Small Circuit Group

The scope of the small circuit breaker group of the air circuit breaker section, which was recently organized, has been defined to include:

Any breaker designed for use on branch lighting and appliance circuits of 15 and 25 amp. capacity, 250 volts maximum; panel board branch breakers of 15, 30 and 60 amp. capacity, 250 volts maximum; service entrance breaker up to 250 volts maximum capacity for D. C. and single phase up to 250 volts maximum, with or without meter test facilities, shall be considered as being governed by the small air circuit breaker application rules.

The Panelboard and Distribution Board Section has voted in favor of a Federal Trade Practice Conference.

Facts, Figures and Trends

Statistical information of value to electrical manufacturers in working out policies and plans for production and marketing

Great Britain's Trade in Electrical Equipment

Total imports of electrical goods and apparatus into Great Britain during 1928 increased 10 per cent over 1927. The use of domestic electric refrigerators is gaining due to the food protection laws. The increased use of fractional horsepower motors is dependent upon domestic electric refrigerators. Household electric appliances had a record year, with American vacuum cleaners, washing machines, irons and fixtures finding a ready sale and prospects good.

No Market for Refrigerators in Bolivia

It is reported that no automatic refrigerators are in use in the Republic of Bolivia, neither is there believed to be any demand for a household appliance of this sort, for the reason that the principal cities are situated at an altitude of from 7,500 to 12,500 ft. above sea level. The result is that the climate is cool throughout the year, and refrigeration of food products is ordinarily not required.

Market for Storage Batteries in Lithuania

A small but steadily growing market for storage batteries exists in Lithuania. Although neither the number of radio sets nor that of automobiles is large in comparison with western European countries, sales of both of these commodities are gradually increasing. Practically all radio sets are battery operated since differences in the kinds of electric current have almost eliminated the sale of sets equipped with battery eliminators.

The chief competition is encountered from a German-made battery of low price. At present the only American storage batteries on this market are used in automobiles, but there exists a good though small market for batteries for use with radios, and American manufacturers who can meet the prices of the German battery referred to should take steps to secure representation. The sale of radio sets is gradually increasing, and the presence of American batteries would establish their reputations and be of value at a time when the market has developed.

Conditions in France

There has been no marked change in the favorable business conditions that have existed in France for some time. The iron and steel production has been maintained at a record figure, and the cold weather has intensified the demand for coal. The engineering trades are fully employed and further advance is only hindered by the labor shortage. Manufacturers of mining equipment, machine tools and railway specialties are operating at capacity production. Prospects for sales of agricultural implements are exceptionally good. Railway car builders have recently received heavy orders, and hardware manufacturers are enjoying brisk business.

Stocks of Fans Decreased in Australia

A record season in Australia has practically decreased stocks of electric fans due to hot weather, according to reports of the Electrical Equipment Division of the Department of Commerce. The installation of electric ranges is increasing, and there is a steady demand for electric irons, kettles, toasters, cleaners and refrigerators.

Consumption of Electricity Increases

The total capacity of prime movers (that is, water wheels, steam engines, turbines and internal combustion engines) in public utility plants, factories, mines and quarries in the United States on Jan. 1 of this year was 56½ million horsepower, according to the Federal Power Commission. This total does not include railroad locomotives, motor vehicles or water craft.

Approximately two-thirds of this entire prime mover installation is in electric public utility plants, which now have a total installed capacity of 37½ million horsepower, including railway as well as electric light and power stations.

The prime mover capacity of the country has almost doubled since 1910 and has increased more than threefold in the last quarter century, according to the Commission.

1928 Industrial Production Greatest in History

Statistics compiled by the Federal Reserve Board indicate that industrial production and distribution in 1928 were greater in volume than in any previous year. The advance in production volume was especially marked in automobiles and related products, in iron and steel, and in copper, while cotton textiles and bituminous coal were less active than in earlier years, although both recovered somewhat in the fourth quarter. Output of automobile tires and inner tubes was also considerably larger than in previous years, as was steel production. Silk and rayon industries continued the rapid growth of recent years. Output of leather and shoes was in approximately the same volume as in 1927, the largest since 1923.

Electric Refrigeration in Denmark

A well-known American electric refrigerator, which was introduced into Denmark some three years ago, has, as a result of vigorous and active advertising and salesmanship, proved a great success on the Danish market. Sales have been, generally speaking, greater than was expected. The Danish public is fast becoming educated to the advantages of this particular kind of refrigeration, and butchers, delicatessen stores and hotels have also been quick to see the value and necessity of utilizing refrigerators of this kind.

Electric Lighting in Rio de Janeiro

Private consumption of electricity for illumination during 1927 in the city of Rio de Janeiro amounted to 46,048,522 kilowatt-hours, some 60 per cent of the total consumption being distributed through 111,427 private meters. Taking 1,600,000 as the population of the city and eight persons to each home, there are 200,000 homes with only a little over 100,000, slightly over 50 per cent, using electricity for lighting. Candles and kerosene lamps are still in common use among the poorer people of the city.

Market for Flash Light Cases in Netherland East Indies

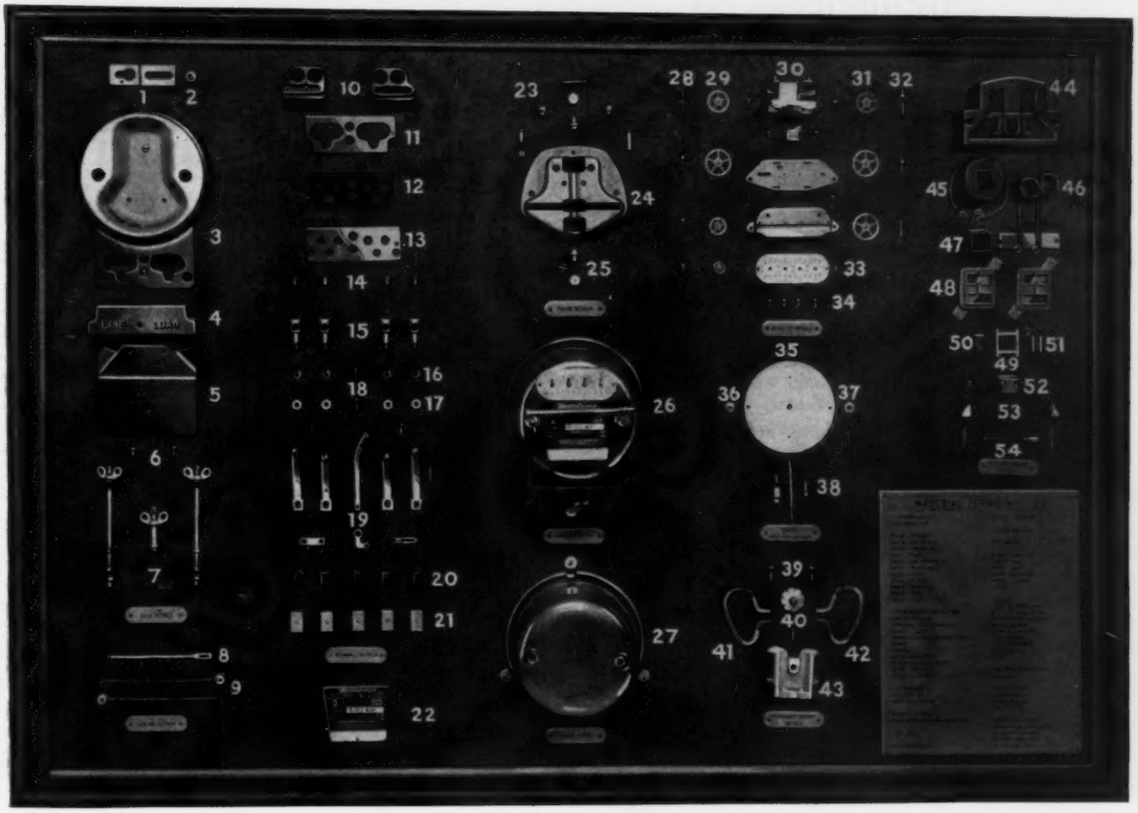
There is quite a large and steady demand for flash light cases in the Netherland East Indies, the only question being whether or not the line is competitive in price. The type generally preferred in this market is the nickel case with focussing device, which constitutes approximately 95 per cent of the trade.

Bankruptcies Decreasing

R. G. Dun & Co. are quoted, in a recent number of *Trends and Indications*, as reporting commercial failures in the United States in 1928 to have totaled 23,930, compared with the 1927 record of 23,146. Although this represents a gain of 3.5 per cent, it is stated that the rise is not considered startling in view of the larger total of firms and individuals engaged in business.

Despite this increase in number of failures, total liabilities are reported to have fallen almost 7 per cent below the 1927 figure. In 1928 liabilities amounted to $484,300,000; in 1927 they were $520,104,268, and in 1921, the record year, $627,401,883. It is stated that the average of liabilities per failure in 1928 was about $20,240, which, with the exception of 1926, is said to have been the lowest in eight years.

Watthour Meter Parts



ELECTRICAL MANUFACTURING *acknowledges the assistance of the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., in the preparation of the illustration and table of watthour meter components. This illustration is taken from a display board used by this company. According to Department of Commerce figures for* 1927, *there were* 1,933,976 *watthour meters manufactured during that year. The total valuation of these meters was placed at* $16,547,034.

Approximately fourteen different raw materials are required in the manufacture of watthour meters

Table of Parts and Raw Materials Used in Watthour Meter Construction

Part No.	Description	Material	Part No.	Description	Material
1	Mounting lug	Steel	29	Gears	Brass
2	Rivet	Steel	30	Register frame	Brass
3	Base	Steel	31	Gears	Brass
4	Terminal cover	Steel	32	Shafts and pinions	Brass
5	Rear terminal cover	Steel	33	Dial	Aluminum
6	Split rivets	Brass	34	Dial pointers	Brass
7	Cover mounting studs	Brass	35	Disc	Aluminum
8	Sealing bar	Aluminum	36	Hub	Aluminum alloy
9	Seals	Iron and lead	37	Washer	Aluminum alloy
10	Terminal blocks	Molded composition	38	Shaft and bearing	Aluminum alloy, steel, sapphire
11	Insulating plate	Fibre	39	Magnet screws	Brass
12	Gasket	Felt	40	Adjuster	Steel, brass
13	Insulating plate	Fibre	41	Magnet	Steel
14	Terminal screws	Steel	42	Magnet	Steel
15	Terminals	Brass	43	Magnet clamp	Copper alloy
16	Lock washers	Steel	44	Laminations for electro-magnet	Steel
17	Nuts	Brass	45	Voltage coil	Copper, insulation
18	Screws	Brass	46	Current coil	Copper, insulation
19	Terminal connectors	Brass	47	Insulation	Treated fabric, fibre
20	Insulating sleeves	Treated fabric	48	Insulation	Treated fabric, fibre
21	Insulation	Fish paper	49	Power factor compensator	Copper alloy
22	Name plate	Aluminum	50	Lamination rivets	Copper
23	Bearings	Brass, sapphire, steel	51	Wedges	Copper
24	Frame	Steel	52	Slow speed adjustment	Brass
25	Bearing caps	Brass	53	Adjustment brackets	Brass
26	Complete meter		54	Adjustment screw	Brass
27	Cover	Glass			
28	Shafts and pinions	Brass			

France Wants American Appliances

(*Continued from page 29*)

washer except in the bathroom! French kitchens have about the same dimensions as a good-sized kitchenette in America, and there is never any basement provision for laundry work, nor any drying place except a network of overhead racks that work on pulleys and form a canopy of wet clothes across the ceiling.

Both the washer and the electric iron are used in the bathroom of the model apartment of the Ligue d'Organisation Ménagère, the French housewives' society. And our American washers, for the most part, are well adapted to this intimate use because they're compactly designed and have the machinery well housed.

If I predict that washers in Paris will be used in the bathroom, I prophesy just as confidently that washers in the Provinces will be used in the backyard!

In the Provinces, in the smaller towns, people live in houses and the houses have basements—according to a survey just completed for the oil-burner manufacturers. This means that there will be space for the washer in the more ample kitchen of a good-sized house, or in an improvised laundry in the basement.

But women who have been kneeling at the riverbank for countless generations, have certain ideas about the cleansing action of the sun and wind and they're going to run an extension cord out the back window and operate the washer on the lawn!

This is the first installment of Miss Dignam's discussion of the appliance market in France. In the concluding section, to be published in the May issue, she continues to explain market conditions for other appliances, and at the same time discusses electrical development in France.—Editor.

R.M.A. Patent Agreement

(*Continued from page 60*)

As appears in Sections 2 and 4 of Paragraph D of Article II, the licenses are personal, indivisible, non-assignable and irrevocable shoprights for manufacture only in regular manufacturing establishments of the subscribers.

It is also provided in Section 5 of Paragraph D of Article II that no rights are granted under foreign patents.

The following Section 6 provides that licenses shall be granted

> "only for so long as the licensee named therein shall remain a member of the 'Association' in good standing and shall not be in default under this agreement, and for six months thereafter, but in no event beyond the 31st day of December, 1933, except as hereinafter prescribed in Article X of this agreement."

Article X provides that the agreement may be extended after December 31, 1933, not exceeding five years, unless at least fifty-one per cent of the Subscribers then in good standing as members of the Association, and not in default under the agreement, shall revoke it. After December 31, 1933, any signer of the agreement may terminate the license as to himself upon six months' prior notice to the association of his desire so to do.

The cross-licensing agreement as provided in Paragraph 2 of Article IV will not become operative "until at least 51 per cent of the members of the 'Association' have adopted the cross-licensing agreement." After the contract becomes operative as provided in Paragraph 2 just discussed, the other members of the Association who have not adopted the agreement, will be given six months' notice that they also may become Subscribers by adopting it.

Article 8 provides that Subscribers to the cross-licensing agreement waive all claims for damages or profits against all of the Subscribers arising out of the manufacture or sale of licensed devices or parts or accessories therefor, unless the damages or profits were in litigation by suit or proceedings actually commenced before March 1, 1928.

Airplane Lighting Equipment

(*Continued from page 35*)

tery S.A.E. No. 36) will, when fully charged, provide a fair illumination for landing for a maximum of about 33 minutes under good design conditions and 5 to 10 minutes less when design or installation conditions are not of the best. Some pilots have found the use of one landing light valuable in bad weather as a means for following natural landmarks between intermediate beacons; here a generator becomes a necessity, to relieve the battery of this extra demand for energy. The use of a generator as a vital part of the electrical equipment is therefore certain to increase.

While there are no definite data available covering socket voltages at the landing lights on generator-equipped planes, investigations made on airplanes equipped with a battery alone have shown that the lamps available at present give from 40 to not more than 60 per cent of their rated illumination when used with the battery fully charged. The latter figure is the best possible condition that has been observed to date on an installation without a generator. One-third rated illumination is considered the absolute minimum with which a safe emergency landing may be made and this minimum will be reached in slightly less than 26 minutes under conditions observed on some airplanes investigated. This is plenty of time if a fully charged battery is available at the time of emergency, but the emergency is very likely to arise in bad weather after considerable battery capacity has already been used. The standardization of improved design to provide illumination for a longer time with present electrical power equipment should not prove a difficult task.

Generator Design Progress

(*Continued from page 66*)

material (brass) is drawn as shown in the illustration.

Due to the connections thus made between the iron core and the sleeve, the surface of the coil at this point is artificially brought to the potential of the core, i.e., to earth potential, and all discharge phenomena can be easily and effectively eliminated by covering this edge with a layer of insulating material after the edge has been rounded off.

The stator windings, being the most important part of alternators, demand the greatest care on the part of the designer. From the point of view of design, they are divided into two classes: coil windings and bar windings. Windings are considered to be of the latter type when each slot contains only one or two turns or bars, each bar being insulated for the full voltage. Such an arrangement is employed only when the current is in excess of 600 amperes.

When the bar becomes of considerable cross-section, it is advisable to employ some method of lessening to as great an extent as possible the eddy-current losses resulting from skin effect. The twisted-strand type of stator winding, in which the bars are built up of a number of strips and are transposed so that each strand occupies in turn every possible position in the cross-section of the slot, has proved to be the most satisfactory form of bar winding, and has the advantage of simplicity.

Divided circuits are frequently used in order to utilize the most suitable copper dimensions.

Vulcanized Fibre is only 56 years old —yet "National" has been making it for more than half a century!

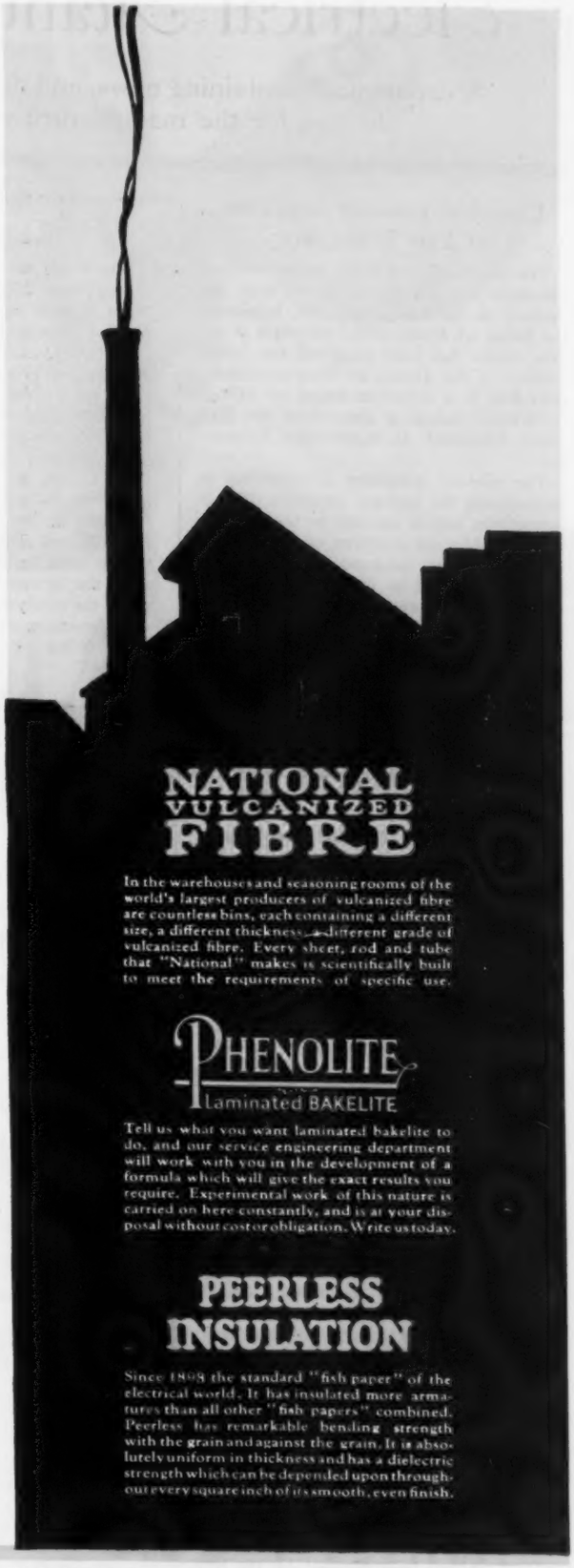
"National" lays claim to seniority in the manufacture of vulcanized fibre; but we do not hold our years of experience as our paramount asset. The knowledge we have *applied to our product* and the thorough understanding of the electrical industry's needs are of far greater value to customers than our gray hairs.

We were pioneers in 1873 and we are still pioneers in 1929— invading new fields, helping to develop new uses and constantly improving the quality of our products.

Offices in these principal cities

Baltimore	Milwaukee
Birmingham	New Haven
Boston	New York
Chicago	Philadelphia
Cleveland	Pittsburgh
Denver	Rochester
Detroit	San Francisco
Greenville	Seattle
Los Angeles	St. Louis

Toronto


NATIONAL
VULCANIZED
FIBRE
In the warehouses and seasoning rooms of the world's largest producers of vulcanized fibre are countless bins, each containing a different size, a different thickness—a different grade of vulcanized fibre. Every sheet, rod and tube that "National" makes is scientifically built to meet the requirements of specific use.
PHENOLITE
Laminated BAKELITE
Tell us what you want laminated bakelite to do, and our service engineering department will work with you in the development of a formula which will give the exact results you require. Experimental work of this nature is carried on here constantly, and is at your disposal without cost or obligation. Write us today.
PEERLESS
INSULATION
Since 1898 the standard "fish paper" of the electrical world. It has insulated more armatures than all other "fish papers" combined. Peerless has remarkable bending strength with the grain and against the grain. It is absolutely uniform in thickness and has a dielectric strength which can be depended upon throughout every square inch of its smooth, even finish.

NATIONAL VULCANIZED FIBRE COMPANY, WILMINGTON, DEL.

Electrical Manufacturing News

A department containing news, and descriptions of new materials, parts and devices for the manufacture and repair of electrical products

Electrical Industry Approves of Fair Trade Act

The electrical and radio manufacturing industries are heartily in accord with the purpose of the Fair Trade Act, legalizing the fixing of resale prices on staple products, which has been proposed for introduction in the House of Representatives, according to a statement issued by Alfred E. Waller, managing director of the National Electrical Manufacturers Association.

The vice of predatory price-cutting is undermining the business structure of fair competition and is inimical to the interest of both public and producer, said Mr. Waller. In many instances manufacturers have been forced to cheapen their products in order to lower their costs and thus attempt to meet the ruinously low prices that result from competitive price warfare. The result is a vicious circle of cause and effect which often wipes out the manufacturer's legitimate profit, destroys fair competition and exposes the public to fire and casualty hazards due to the manufacture of merchandise below the accepted safety standards of the industry.

Speaking on behalf of the Nema radio division, Mr. Waller declared that the proposed legislation would be especially beneficial to the radio manufacturing industry by permitting contracts governing the sale of identified goods at a fair and uniform price to the public. The rapid growth of the radio industry has made it difficult to arrive at stability in merchandising, and to avoid the dangers of "dumping" and reckless price-cutting. The legalizing of resale price maintenance under the proposed Fair Trade Act would immediately improve the economic condition of the industry and protect the individual purchaser against fraudulent sales.

R.M.A. Exhibition Space Is Over-Subscribed

The 30,000 sq. ft. of exhibit space in the three hotels which will house the Radio Manufacturers Association annual convention and trade show in Chicago the week of June 3 have already been oversubscribed, and space allotments will be made soon, according to an announcement by the R.M.A. Show Committee. The committee will send out invitations to the industry at large in the near future.

Radio dealers and jobbers, as well as manufacturers from all parts of the United States, together with those of the music industry, will gather at Chicago during the week of June 3. The principal hotels of Chicago have been engaged for the big industry events. In past years the R.M.A. trade show and convention have been held at the Stevens Hotel. This year, however, because of the great demand for exhibition space and the many new lines to be displayed to the trade, it has been found necessary to take over the Blackstone and Congress Hotels, in addition to the Stevens Hotel, for the R.M.A. events.

"RESOID"

That's the word which has been chosen from 521 submittals in the name contest sponsored by the Molded Insulation Section of the National Electrical Manufacturers Association, to determine a generic name for molded products. Ottomar Block of Caldwell, N. J., was the winner of the $250 prize.

The Nema Molded Insulation Section will consider matters relating to the adoption of the word "resoid," at its next general meeting. Meanwhile, ELECTRICAL MANUFACTURING desires to find out just what the industry in general thinks about the newly-coined term, and invite comments, addressed to the Editor. What do you think of "resoid?"

New Auditorium Will House N. E. L. A. Convention

The week of June 3, 1929, promises to be a memorable one for the electrical industry. The fifty-second convention and exhibition of the National Electric Light Association coincides with the fiftieth anniversary of the invention of the incandescent lamp, and the latter event will be commemorated with special observances. The new Atlantic City Convention Hall, which will house the N. E. L. A. gathering, offers facilities hitherto unavailable.

Despite the fact that present plans indicate an elaborate and comprehensive exhibition and convention, the business sessions are being so arranged that the primary function of a convention, to afford an interchange of ideas, will not be neglected, but rather enhanced.

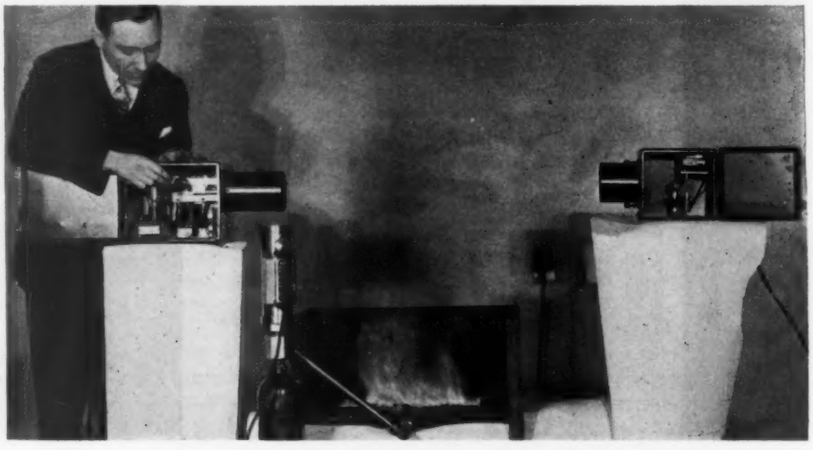
In order that exhibitors may take full advantage of the opportunity to place their products before the general public, the opening date of the exhibition has been advanced to Friday, May 31.

Department of Commerce Issues World Radio Market Survey

During the last seven years exports of American radio equipment and supplies have amounted to approximately $50,000,000. In 1928 total shipments of this class of merchandise from the United States reached a value of more than $12,000,000, establishing a new high record. While radio development in foreign countries has not progressed to the same degree as in this, rapid strides are being made in most areas. About 90 per cent of all the radio equipment in use throughout the world is the product of three countries—the United States, Germany and Great Britain.

The Department of Commerce has just completed a comprehensive analysis of the world's markets for radio equipment and supplies. More than 100 separate coun-

Photo-Electric Device Shows Superhuman Dependability



A DEVICE which detects and extinguishes fire with superhuman accuracy and dependability was recently demonstrated in New York. A lighted match thrown into a gasoline tank set off the photo-electric "fire detector", which in turn automatically released carbon dioxide from a cylinder to extinguish the flame instantaneously

This MARK *is your* GUARANTEE

Look for the word "Empire" on oiled electrical insulations! It is your guarantee of uniform high quality, of an insulation that successfully withstands the ravages of time.

Only the finest of linseed oil, the strongest, most uniform of cloths and papers are used. Rigid inspection assures this. Manufacture has been perfected to such an extent that the original high dielectric strength and flexibility of Empire electrical insulation is retained indefinitely.

If you require cloth, silk, paper or any of the other oiled insulations be sure to ask for "Empire"—the age resisting electrical insulation.

Empire Oiled Insulations: Super-Micanite, and Micanite bonded mica insulation. Mica Insulating Varnishes, Compounds, Cements, Friction and Rubber Tapes are products of the Mica Insulator Company.

MICA INSULATOR COMPANY

New York: 200 Varick St. Chicago: 542 So. Dearborn St.
Works: Schenectady, N. Y. London, England

Cleveland, Pittsburgh, Cincinnati, Seattle, San Francisco, Montreal, Toronto, Los Angeles

PERFECT MICANITE INSULATOR
REG. U.S. PAT. OFF.

Electrical INSULATION

PERFECT EMPIRE INSULATOR
REG. U.S. PAT. OFF.

MICA INSULATION OILED CLOTH INSULATION

tries have been surveyed and the following factors examined: extent of radio development; characteristics of people; climate and geographic conditions affecting radio.

This survey is being issued as a trade information bulletin which is now ready for distribution. Besides the data referred to above, the report includes these valuable statistics: estimated radio sets in use by countries; broadcasting stations showing call letters, wave lengths and power; regulations governing operation of stations and ownership of receiving sets.

Copies of this Trade Information Bulletin 600 may be obtained from any branch office of the Bureau of Foreign and Domestic Commerce or from the Superintendent of Documents, Government Printing Office, Washingon, D. C. Ten cents should be inclosed.

J. F. Lincoln Elected President of Lincoln Electric Co.

Lincoln Electric Company, Cleveland, Ohio, has elected J. F. Lincoln, formerly vice-president, to the presidency. J. C. Lincoln, former president, has been named chairman of the board of directors.

Since 1912 when he became general manager, J. F. Lincoln has been prominent in the electrical industry. He was among the first to envision the enormous potentialities of electric arc welding as a manufacturing tool, as contrasted with a process for salvage and repair.

So certain was he that arc welded steel construction would supersede other methods of manufacturing machine parts, that he insisted on redesigning the complete line of motors and welders made by his company, to utilize this process. This was at a time when manufacturers were still speculating on the strength and dependability of welds made by the arc process.

Expansive Program for Meeting of U. S. Chamber of Commerce

Twelve conferences, six of which will take place on April 30 and six on May 1, will feature the seventeenth annual meeting of the United States Chamber of Commerce at Washington, D. C., April 29 to May 3. The subjects of the conferences will be discussed around the table by business men from a practical point of view.

The outstanding subjects for the conferences have been outlined as follows: Tuesday, April 30, trade practice conferences; industrial expansion in relation to manufacturing capacity; government and transportation; government's relation to water power and raw materials. Wednesday, May 1, mass merchandising—producer, distributor and consumer; business finance and the credit supply; tariff principles; employer-employe relations; cooperative efforts to conserve life and property.

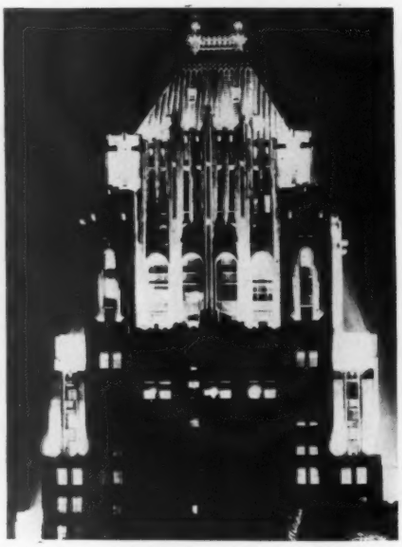
General Electric Earnings Increased During 1928

Earning of the General Electric Company for 1928 amounted to $54,153,806, equivalent, after dividends on the special stock, to $7.15 a share on the 7,211,481 shares of no par common stock, the annual report of the company made public by President Gerard Swope discloses. This compares with $6.41 a share in 1927.

Orders received during the year 1928 were $348,848,512, compared with $309,784,623 in 1927, an increase of 13 per cent, and unfilled orders at the end of the year were $72,953,000, compared with $68,916,000 at the close of 1927, an increase of 6 per cent.

The company's manufacturing plant investment at the end of the year had a cost value of $205,631,890, but deducting $158,075,079 of reserves, the net book value was $47,556,811, or $2,781,560 less than at the end of 1927.

Effective Lighting Attracts



FLOODLIGHTING recommendations were made prior to its construction and the Fisher Building, Detroit, represents a fine example of correct illumination

U. S. Steel Forms Divisional Plan for Subsidiary Advertising

To facilitate the direction and handling of advertising activities of the subsidiary manufacturing and distributing companies of the United States Steel Corporation, such companies have been divided into two groups, Eastern and Western, with special group counsellors to consult with and advise the respective advertising departments.

The Eastern group comprises the American Bridge Company, American Sheet and Tin Plate Company, Carnegie Steel Company, Federal Shipbuilding and Drydock Company, Lorain Steel Company, National Tube Company, Tennessee Coal, Iron and Railroad Company, and United States Steel Products Company. The following group counsellors will be located at Pittsburgh: W. L. Schaeffer, National Tube Company; R. L. Twitchell, Carnegie Steel Company; H. V. Jamison, American Sheet and Tin Plate Company.

The Western group comprises the American Steel and Wire Company, Cyclone Fence Company, Illinois Steel Company, Minnesota Steel Company, and Universal Portland Cement Company. The following group counsellors will be located at Chicago: C. R. Moffat, Illinois Steel Company; M. A. Berns, Universal Portland Cement Company; W. H. Cordes, American Steel and Wire Company.

Fibre and Bakelite Firms Contemplate Merger

The organization of Continental-Diamond Fibre Company to acquire the Continental Fibre Company of Delaware and the Diamond State Fibre Company, Bridgeport, Pa., was recently completed. This consolidates two important factors in the vulcanized fiber and laminated bakelite industry. The products of both companies are complementary rather than competitive and are extensively used for insulation and other purposes.

Battery Manufacturers Plan Cincinnati Meeting

Arrangements have already been completed for a two-day business and social program of the National Battery Manufacturers Association at the Hotel Gibson, Cincinnati, Ohio, April 24, 25 and 26. The first day will be devoted to committee meetings, and the other two to general sessions, at which a number of prominent battery men will bring up problems pertinent to the industry.

Among the speakers, it has been announced, will be included a member of the Federal Trade Commission and officials of the United States Chamber of Commerce. There will also be a number of addresses treating technical subjects of interest to the industry.

New Executives Are Elected by Johns-Manville

At a recent meeting of the board of directors of the Johns-Manville Corporation, William R. Seigle, formerly vice-president in charge of mines and factories, was elected chairman of the board of directors, and Lewis H. Brown, formerly secretary of the corporation and assistant to the president, was elected president. Mr. Seigle succeeds H. E. Manville, resigned, and Mr. Brown succeeds Theodore F. Merseles, who passed away March 6 of this year.

William R. Seigle

Mr. Seigle was born at Easton, Pa., in 1879, and has been in the service of Johns-Manville since he was graduated from college in 1900, at which time the corporation was known as the H. W. Johns Manufacturing Company. His technical training covered the fields of mechanical and electrical engineering, as well as electro-chemistry. His remarkable research and development abilities have been responsible for the development of many of the insulating, electrical and building materials upon which the company has

Suppose this had happened at Your Plant—
What would the outcome have been?

AN explosion demolished the entire end of the above building in the Factory of the American Agricultural Chemical Company, Searsport, Maine.

Fire ensued, but was confined to that particular part of the building because of the protection afforded by Ambler Asbestos Corrugated which covered the roof.

The superintendent of this plant has stated that if it had not been for the Ambler Asbestos Corrugated which held in the fire, the Warehouse in the rear, roofed with a cheap, inflammable material, and containing 5000 barrels of acid, would have been destroyed. Of course the Corrugated roofing was severely damaged because of the explosion but it WOULD NOT BURN.

Ambler Asbestos Corrugated is the ideal roofing for industrial uses. It is made of Asbestos fibre and Portland Cement compressed and corrugated under t r e m e n d o u s hydraulic pressure. It is not affected by the elements but really becomes tougher and harder after exposure. We invite you to write for our new Engineers' Data Sheets containing full description and details of application.

BRANCHES
Boston, Mass.
Buffalo, N. Y.
Chicago, Ill.
Cleveland, Ohio
Detroit, Mich.
Minneapolis, Minn.

Asbestos Shingle, Slate and Sheathing Company

Factories at
Ambler, Pa. St. Louis, Mo.

BRANCHES
New York, N. Y.
Philadelphia, Pa.
Pittsburgh, Pa.
Washington, D. C.
Wilkes-Barre, Pa.
St. Louis, Mo.

based its substantial success. His greatest hobby today is his completely equipped private laboratory for electrical, chemical, mechanical, and general research at his country home at Mamaroneck, N. Y., where he employs regularly a staff of experts in various fields and in which he spends much of his own time.

Lewis H. Brown

Under his leadership the mines and factories making up the manufacturing units of Johns - Manville have been greatly enlarged and improved by the introduction of labor and time - saving devices. Many new plants have been built, including the important factories located in Asbestos, Canada, Waukegan, Ill., and Pittsburg, Cal. He is an officer and director in numerous other corporations here and abroad.

Mr. Brown was born in Creston, Iowa, in 1894, and is a graduate of the University of Iowa, where he studied liberal arts and law. After graduation he became a salesman and assistant to the sales manager of a manufacturing company in Indiana. Immediately after the war he joined Montgomery Ward & Company, serving in various departments of the business, including such important responsibilities as those of office manager, superintendent of merchandise, and assistant general operating manager of all plants.

From 1921 to 1927 he was in close personal contact with the late Theodore F. Merseles and George B. Everitt, now president of Montgomery Ward & Company, during the remarkable years of the reorganization and revitalizing of Montgomery Ward. These years were devoted to work in planning and carrying into effect the broad, basic principles of merchandising, marketing and distribution instituted by Mr. Merseles, and which resulted in the amazing growth of profits and men at Montgomery Ward.

Recognizing that in Lewis H. Brown he had developed an able executive with imagination, character and a remarkable ability to handle difficult organization problems, Mr. Merseles selected Mr. Brown to accompany him as his assistant when he became president of Johns-Manville in August, 1927.

He is a member of the board of directors of the Fibre Conduit Corporation and numerous others.

Automatic Electric Heater Chooses New Officers

Changes in the official personnel of the Automatic Electric Heater Company, Pottstown, Pa., have been announced following the increased capitalization of this company to take care of its program of expansion. The trade name under which the company's heaters are sold, "Sepco Flameless," will be maintained, besides which an entirely new line of air heaters, glue and solder pots, and special electric heating units will be introduced.

Officials of the company have outlined plans which are designed to take care of its increased expansion. James W. Bailey remains as president; W. C. Sears, formerly with Landers, Frary & Clark and Robeson Rochester Co., has been admitted to partnership in the corporation, as vice-president and general manager, while John Dougherty remains as secretary, and W. F. Clark, inventor of the Sepco water heater, remains as vice-president in charge of sales. Other appointments in the company include Gordon H. Clark, director of research; K. P. Goewey, special representative for the Middle West; N. Pedroso, in charge of advertising; A. R. Colburn, special representative, and F. Sonn, superintendent of works.

Beardsley & Wolcott Officers Elected at Annual Meeting

Charles W. Schwank has been elected vice-president of the Beardsley & Wolcott Manufacturing Company, Waterbury, Conn., manufacturer of Torrid electric appliances. Mr. Schwank has been associated with the Torrid organization for the past fifteen months in the capacity of general sales manager of the electrical, hardware and house-furnishings divisions. Previous to this he was general sales manager of the Carroll Electric Company, Washington, D. C., and president of his own shoe manufacturing company. He is also the author of several books on selling, and has had a background of sales and manufacturing experience.

C. E. Beardsley was reelected president and Frank E. Wolcott reelected first vice-president. Robert Booth was elected vice-president in charge of manufacturing. F. E. Coster, president of McKesson & Robbins Company, Mr. Schwank and Mr. Booth were elected to the Board of Directors.

New Gearing Apparatus Manager Appointed by Westinghouse

Following the resignation of J. E. Mullen as gearing apparatus sales manager of the Westinghouse Electric & Manufacturing Company, E. E. Boone has been appointed to this position.

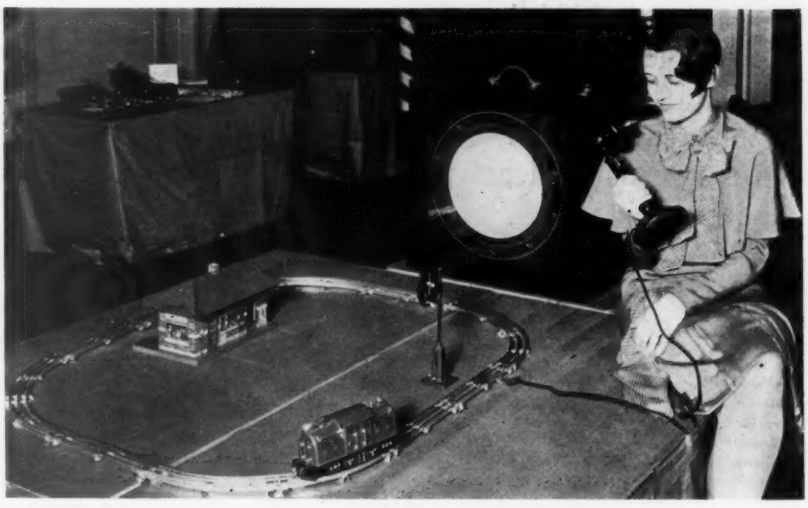
E. E. Boone

Mr. Boone was graduated in 1911 from the University of Illinois in electrical engineering. He entered the Westinghouse Company following his graduation on the Graduate Student Course. After completing his course in industrial sales, he entered the mining section of that division, of which he later became manager. Following several years' activity as manager of the coal and oil section, he entered the mixed apparatus sales division in 1925, where he remained until his appointment as gearing apparatus manager. Mr. Boone will be located at the R. D. Nuttall Works of the Westinghouse Company in Pittsburgh, Pa.

A. C. Receivers Increase Rapidly While Battery Sets Fall Off

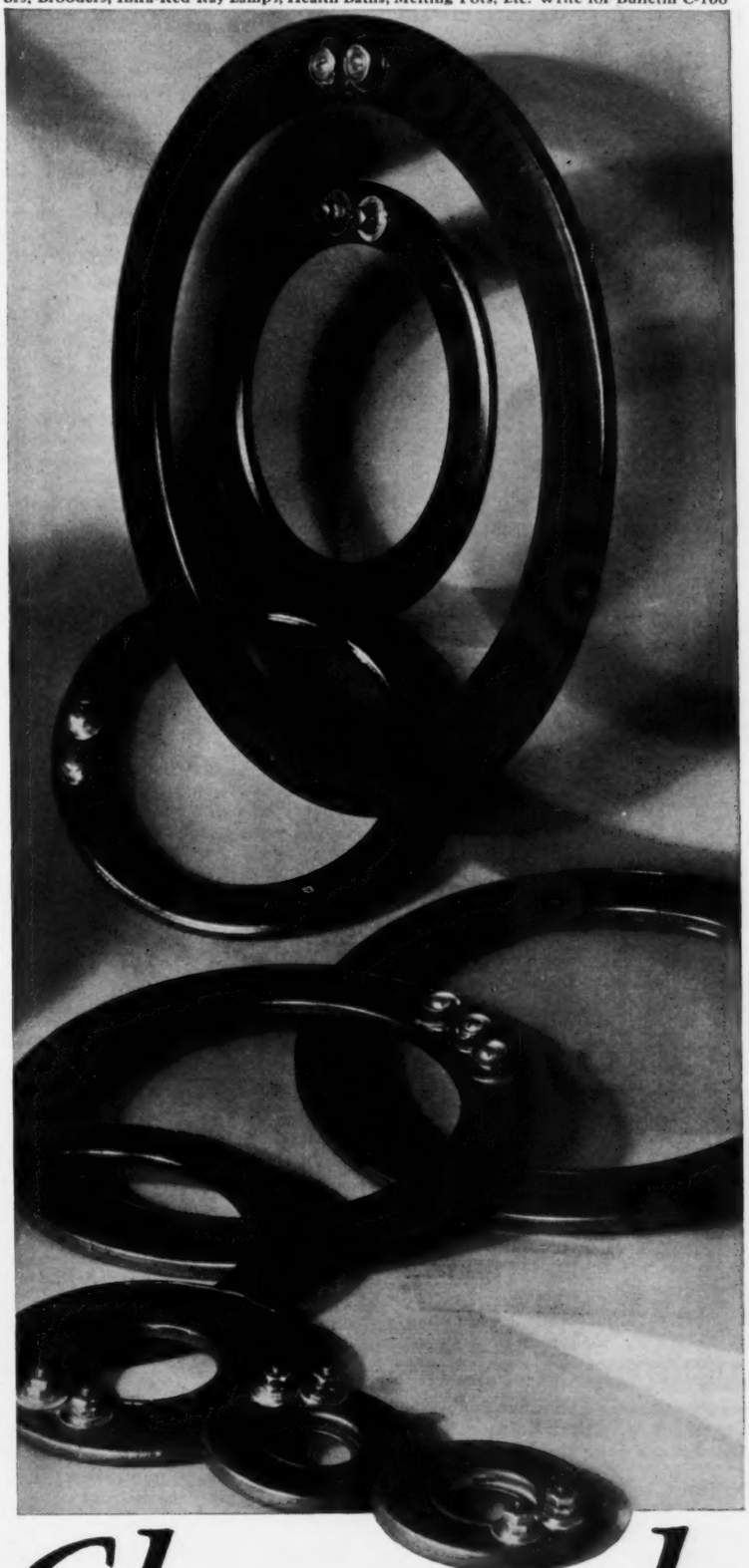
The number of A.C. radio receiving sets sold in 1928 increased 456 per cent over 1927, according to a statement issued by Edgar H. Felix, radio consultant of the National Electrical Manufacturers Association. This remarkable rise is indicated by the Jan. 1 quarterly survey of stocks in the hands of radio dealers and gross sales prepared by the Department of Commerce in cooperation with the ra-

Direct Action Follows These Spoken Commands



"BACK UP," orders the fair miss pictured above, and "Casey Jones," toy locomotive, hastens to obey her command. The orders are issued through an ordinary telephone transmitter, the action of the engine being dependent upon the voice impulses. Commands such as "stop" and "go ahead, Casey," affect the train in other ways

★Chromalox Ring Units, Single or 3-heat, 2½" to 11" diameter, 110 or 220 volts. Used by leading makers of Electric Ranges, Waffle Bakers, Coffee Urns, Percolators, Sandwich Toasters, Incubators, Brooders, Infra-Red Ray Lamps, Health Baths, Melting Pots, Etc. Write for Bulletin C-106



Make your products *trouble-free* . . . . . from the start

Over 60 far-sighted manufacturers are doing it. Tests and experiments soon showed that it's more economical all around to equip products with patented Chromalox heating units.

IT'S like building an automobile . . . or a fine watch. The motor, the works, the insides must be right or it won't go. You are making appliances. Fine looking . . . latest designs . . . destined to be best-sellers.

The most important part of your product is out of sight

But what about the heating units that are out of sight and yet responsible for the every day successful operation of that waffle baker or electric range or water heater? Are they going to deliver the right heat everytime the switch is turned on?

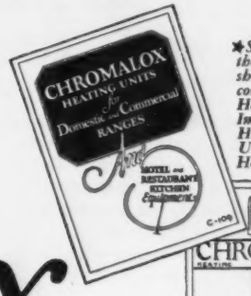
Not a single burn-out in 58,000 heaters

That report just comes from an ironing machine manufacturer. It's his five-year experience with Chromalox heaters. Other companies report similar satisfactory operating records. Your own products can be made just as trouble-free by using these patented Chromalox units.

Start now to make your products trouble-free

Customers call us in to show them the right way to build in the heating units. Result, assembly costs are lowered, trouble is side-tracked. Whether you are working on a new product or improving an old one, tell us about the appliances or heating devices you want properly heated. There's no obligation!

EDWIN L. WIEGAND CO.
421 First Avenue · Pittsburgh, Pa.



★*Send for your copy of these 8-page bulletins showing the largest complete line of Strip Heaters, Ring Units, Immersion Heaters, High-Speed Range Units and Special Heaters.*

Chromalox
ELECTRIC HEATING UNITS

dio division of Nema. The total number of A.C., D.C. and battery sets sold by radio dealers increased from 1,558,040 to 2,196,242 for 1927 and 1928, respectively.

The survey shows that on Jan. 1 there were 67,214 sets in the hands of dealers, and assuming a total of 150,000 additional sets in the hands of jobbers, manufacturers and en route for shipment, the grand total becomes 2,400,000 radio receiving sets of all kinds manufactured during 1928. The gain of last year's sales over 1927 in number of sets of all kinds sold amounted to 40 per cent. Some of the four and one-half fold increase in the sale of A.C. sets is accounted for by the reduced sale of battery powered sets which fell from 1,143,031 in 1927 to 303,435 in 1928, and from 73.4 per cent of the total set sales to only 13.9 per cent for 1928.

This reduction in battery set sales has an important bearing on total retail sales, inasmuch as each battery receiver requires a complement of associated accessories having a value usually equal to that of the receiver itself. An idea of retail sales thus lost can be gained from the fact that on Jan. 1, 1927, there were 197,431 "A, A-B and B" power units in the hands of dealers, while a year later this number had fallen by about two-thirds to 66,115. The reduced sale of accessories, lower price of tubes accompanying receiver sales and the tendency to make receivers complete with loud speakers and radio furniture, has concentrated most of the sales made by radio dealers in the products of receiver manufacturers, and greatly reduced the formerly large associated accessory and supply business.

Furthermore, the average price of receivers has fallen off so that the retail dealer must sell more sets to make the same profit he did formerly. The average sales made per receiving set sold has decreased from $231 in 1927 to $158 last year. In fact, the survey shows a retail sale of $342,536,848 for the calendar year 1928, as compared with 1927 sales through radio dealers of $360,258,135.

A truer and more optimistic picture is gained by considering the actual radio season running from midsummer to midsummer. The indicated sales of $186,152,039 for the fourth quarter of 1928 amounted to 53.5 per cent of the year's total business. If the two remaining quarters of the 1928-1929 radio season run ahead of the corresponding quarters of last season at the same rate, the total business will be in excess of $650,000,000.

Brevities

Jenkins Television Corporation, Jersey City, N. J., has been granted the necessary transmitting licenses and is building a powerful television transmitter in Jersey City and another in Washington, D. C. The former will operate at a frequency of 2150 kilocycles, with a variable power up to 5 kilowatts.

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, has purchased from the Scott-Ullman Company of Cleveland, the patents, dies and rights for the manufacture and sales of several of that company's lines, among them the Filigree set and the Velveton line.

Gainaday Electric Company, Pittsburgh, Pa., elected the following officers and directors at a recent meeting of stockholders: C. E. Beeson, president; C. B. Barton, vice-president and general manager; W. F. Small, treasurer; W. H. McBride, secretary; directors, C. E. Beeson, J. W. Henry, Mark R. Craign, Henry W. Heedy, John F. Kraft, Sherman C. Parker, B. M. Bryar and C. B. Barton.

Polymet Manufacturing Company, New York City, maker of electric radio set parts has opened an export division to take care of its rapidly expanding foreign business. The office, under the management of Arthur Rock, is located at 154 Nassau St., New York City.

Benjamin Electric Manufacturing Company, has moved from 120 S. Sagamore St., Chicago, to Des Plaines, Ill., a Chicago suburb.

Electric Heating & Manufacturing Company, Seattle, Wash., announces that Philip F. Apfel has sold his controlling interest in the company to Middleton M. Chism, who is now president of the firm. Mr. Apfel has taken up private practice as an electrical engineer.

Quigley Furnace Specialties Company, 26 Cortlandt St., New York City, has appointed M. F. Behar as advertising manager. He was formerly advertising manager for the C. J. Tagliabue Manufacturing Company.

International General Electric Company has appointed W. R. Herod, formerly of the construction engineering department of the General Electric Company, assistant to Clark H. Minor, president of International G. E.

Zeller Lacquer Manufacturing Company, Inc., 20 E. 49th St., New York City, has named Horace E. Hall sales manager.

New Departure Manufacturing Company, Bristol, Conn., has released plans for a large factory expansion which will add 250,000 sq. ft. of floor space to the company's main works at Bristol and approximately 80,000 sq. ft. to the Meriden plant. The new addition to the Forge plant at Bristol has just been completed and added 25,000 sq. ft., so that the total of increased floor space within the year will reach 355,000 sq. ft.

C. V. Hunt, Inc., electrical motor specialist, has moved from Union City, N. J., to 46 Main St., Lodi, N. J.

Roller-Smith Company, 233 Broadway, New York City, manufacturer of electrical instruments and circuit breakers, has appointed Jackson Brown, Jr., 701 Kittridge Building, Denver, Colo., as representative in Colorado, Wyoming, Utah and Northern New Mexico. The Manila Machinery and Supply Company, Manila, P. I., represents the company in the Philippine Islands.

Ohio Brass Company, Mansfield, Ohio, has opened a new office at 2143 Railway Exchange Building, 611 Olive St., St. Louis, with H. W. Kilkinny, district sales manager, in charge.

Coming Conventions

American Institute of Electrical Engineers.—Regional meeting at Cincinnati, March 20-22; Dallas, Tex., May 7-9; Swampscott, Mass., June 24-29.

American Society of Mechanical Engineers.—Regional meeting at Knoxville, Tenn., March 22-23; Regional meeting at Salt Lake City, Utah, July 1-4.

American Society for Testing Materials.—Annual meeting at the Chalfonte-Haddon Hall, Atlantic City, N. J., June 24-28.

American Welding Society.—Annual meeting at the Engineering Societies Building, 29 W. 39th St., New York City, April 24-26.

Institute of Radio Engineers.—Annual meeting at the Mayflower Hotel, Washington, D. C., May 13-15.

National Association of Purchasing Agents.—Fourteenth Annual International Convention, Buffalo, N. Y., June 3-6.

National Battery Manufacturers' Association.—Convention at Hotel Gibson, Cincinnati, Ohio, April 24-26.

National Electric Light Association.—Annual convention and exhibition at the Municipal Auditorium, Atlantic City, N. J., June 3-7.

National Electrical Manufacturers' Association.—Spring meeting at Hot Springs, Va., week of May 20.

Radio Manufacturers Association.—Annual trade show at the Stevens, Blackstone and Congress Hotels, Chicago, June 3-7.

United States Chamber of Commerce.—Annual meeting at Washington, D. C., April 29-May 3.

Manufacturers' Catalogs

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. Leaflet No. 20370, indoor disconnecting switches of the single-pole, single and double-throw, and selector types. Circular No. 1821, Type W rotary switches. Circular C-1737-D, effective lighting protection, describing the nature and magnitude of transient voltages on electrical systems lightning arrestor requirements and applications. Publication D.M.F. 5128, dealing with the history of reduction gear for marine engines.

Diamond Chain & Manufacturing Company, Indianapolis, Ind. Industrial Booklet No. 104, simplifying and improving machine design.

Driver-Harris Company, Harrison, N. J. Booklet, "Nichrome" and other alloys for electrical resistance.

MACALLEN MICA PARTS ASSEMBLE BETTER

Low assembling costs and Macallen Mica parts go together. And there is a very definite reason for it.

The dimensions of our plate mica, before stamping or forming, are held to limits well within commercial standards. Tapers, angles and other forms and irregular shapes are uniform and exact. Holes are pierced to accurate sizes and in accurate locations. Shells are of proper depth and area both inside and out.

Accuracy at the Macallen plant is almost an obsession. And in your plant it means economy and efficiency.

Write for details of our service to large or small users of commercial mica.

The MACALLEN Co.

BOSTON 27 MASS.

CHICAGO — CLEVELAND

Monitor Controller Company, Baltimore, Md., Bulletin No. 113, A.C. automatic starters.

Wagner Electric Corporation, St. Louis, Mo. Bulletin No. 161, instructions for the installation and operation of power and distribution transformers.

Information Wanted

We have been asked for the names and addresses of manufacturers of the articles listed herewith.

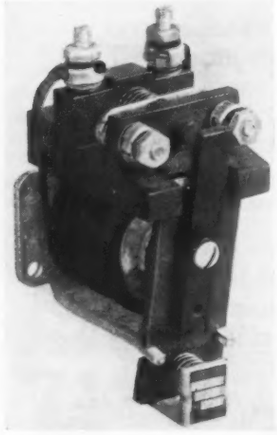
Replies from our readers to any of these inquiries will be greatly appreciated by the Information Bureau of ELECTRICAL MANUFACTURING, 461 Eighth Avenue, New York City.

"Burrows" Therapeutic Lamp.
"L. R. Co." Receptacles.
"Williams" Commutator Dressing.
"Splendida" Electric Iron.
"Graustark" Line of Lighting Fixtures.
"Sal Co. 176" Lamps.
"Electron" Heating Pad.
"Lilly Wilson" Vacuum Cleaner.
"Perkins" Siren.
"Flint" Waffle Iron.
"Packard" Vacuum Cleaner.
"Pioneer" House Pump.
"Blaisdell" Automatic Electric Cigar Lighter.
"Columbus-Universal" Electric Vacuum Cleaner and Floor Polisher.
"Defiance" Cigarette Lighter.
Manufacturers of Electric Incinerators.
Manufacturers of Electric-driven lampshade lacing machines.
"Vesodore" Cigar Lighter.

New Goods for Your Inspection

Alarm Circuit Relay

General Electric Co., Schenectady, N. Y., has placed on the market a relay, CR-2810-1245, for use on various types of alarm circuits. The device is of the normally closed type and functions to actuate a warning signal on the failure of power. The relay is strongly built, of simple construction, and is quiet in operation. The



contact construction is of the silver-to-silver type and double break. It is made in standard ratings. Applications of the relay range from simple failure of power to more involved circumstances where power failure might result in serious consequences. The warning signal may be any sound device, and probably would be energized by batteries.

Panelyte Insulation

Panelyte Corp., Trenton, N. J., is introducing to the trade a manufactured electrical panel material that is homogeneous in construction, made of marble-like material, which is black in color, light in weight, having high electrical resistance and fire-resisting properties. It is obtainable in a variety of sizes and thicknesses, suitable for use in panel construction or for the purpose of insulating material. It has a high dielectric strength and is easily machined or drilled to suit installation or application requirements.

Wire Insulation Remover

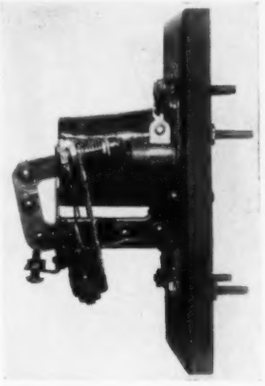
Electric Service Supplies Co., 17th and Cambria Sts., Philadelphia, has placed on the market a wire insulation remover intended for the purpose of skinning the leads of armature coils. This is accomplished by bringing the leads in contact with a special brush revolving at proper speed to

thoroughly remove the insulation from the wire without damage to the copper.

The machine is self-contained for floor mounting, being supplied with a cast iron pedestal and the working parts properly guarded. A shield and spout are provided to carry away the insulation removed, and the machine is controlled by means of a foot pedal. Net weight of the outfit complete is 160 lb.

Quick Acting Relay

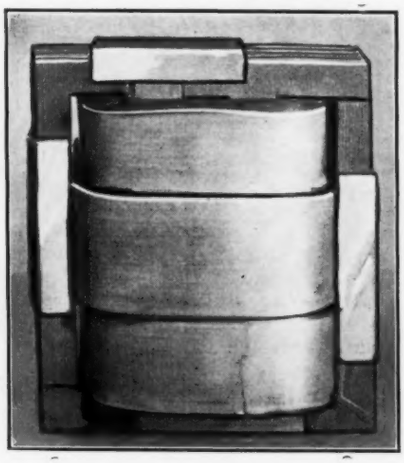
Sundh Electric Co., Inc., Parkhurst St., at Ave. C, Newark, N. J., has placed on the market a small, rugged, quick-acting relay for all standard voltages, A.C. and D.C., in 3 and 6 ampere capacities, with one, two, three or four poles. These relays are made in the following combinations: One pole normally open and one



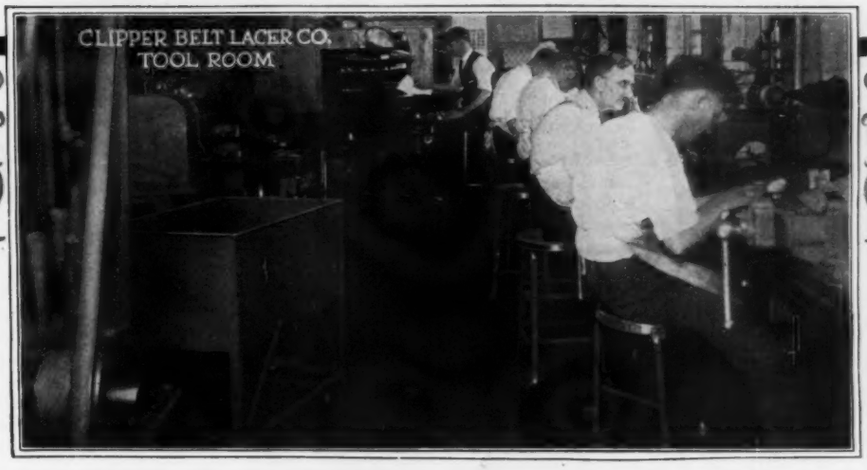
normally closed; two poles normally closed; two poles normally closed and one normally open; one pole normally closed and two normally open; two poles normally closed and two normally open; one pole normally closed and three normally open. It is designed to be free from residual magnetism and requires low wattage for its operation so that it may be used with delicate instruments, such as thermostats and pyrometers.

Automatic Voltage Regulator

Ward Leonard Electric Co., 31 South St., Mt. Vernon, N. Y., has placed on the market an automatic voltage regulator which compensates for line voltage surges and eliminates their effect on the operation of radio receiving sets. The operat-



ing range for this device is 95 to 135 volts. It is designed to be equally effective above and below normal voltage. The use of this device allows the set manufacturer to design his sets with the assurance that there is no danger of the tubes burning out or not operating properly due to variations in line voltage.



Angle Steel Equipment Fits *Every Shop Requirement*

No. 110—Stool
Our most popular factory stool. Hardwood seat, mahogany or oak finished. Steel back-rest is adjustable and removable. Hand-riveted steel construction. Olive green enamel finish.

THERE are hundreds of items in ANGLE STEEL Equipment from which to choose. They are built to fill every shop and factory need. And should you want something special, we will build just what you want for your specific purpose.

The flexibility of numerous items in ANGLE STEEL Equipment makes them adaptable to a wide variety of uses. Valuable floor space is saved, work-in-production is speeded up and labor and handling costs "cut to the bone."

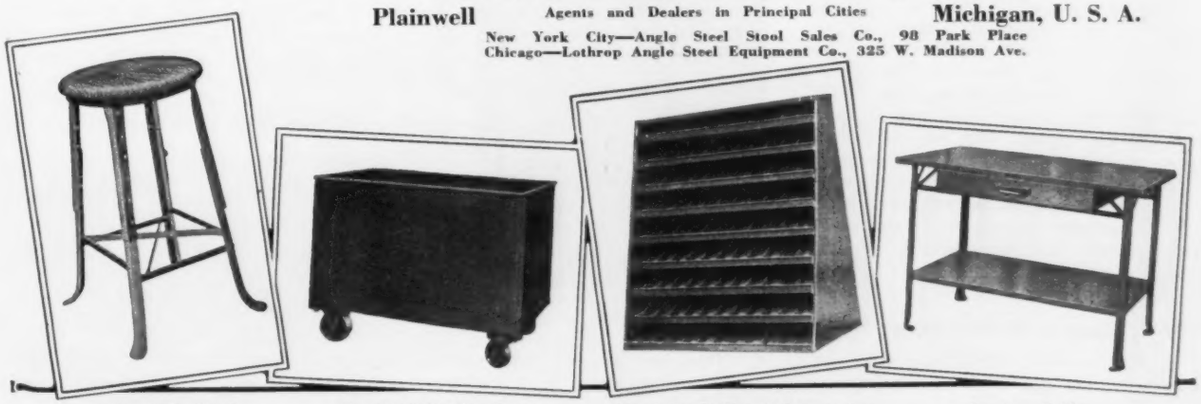
Catalog "C" may be used as a source of supply for factory, shop and office equipment. *Write for it.*

Put your SPECIAL WORK jobs up to us. We will plan, design and quote you without obligation.

ANGLE STEEL STOOL COMPANY

Plainwell Agents and Dealers in Principal Cities **Michigan, U. S. A.**

New York City—Angle Steel Stool Sales Co., 98 Park Place
Chicago—Lothrop Angle Steel Equipment Co., 325 W. Madison Ave.



No. 102—Stool **No. 24-24-4—Box Truck** **No. 108—Drill and Reamer Bin** **No. 70—Table**

Permanence in Steel

ANGLE STEEL EQUIPMENT

Of Steel

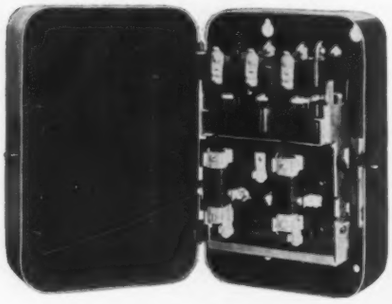
ECONOMICAL - SANITARY - DURABLE

Red Band Condenser Motor

Howell Electric Motors Co., Howell, Mich., announces the Red Band brushless single-phase motor, Type CI (condenser start — induction run). This motor is designed to have starting and pull-out torques and power factor and efficiency characteristics comparable to the corresponding polyphase ratings. It has no brushes, commutator, wire wound rotor, internal switching device or soldered rotor contacts. The manufacturer states that this motor can be plugged and reversed at full speed, making it ideal for use for single-phase operation of elevators, hoists, automatic doors and windows, woodworking machines, etc. Its stator windings are similar to an ordinary two-phase motor, with the starting condenser connected across one phase. Starting torque is supplied by an external starting unit containing the condenser and contactor, which automatically disconnects it from the circuit when the motor comes up to full speed.

Cross Line Motor Starter

Condit Elec. Mfg. Corp., 842 Summer St., Boston, is building Type A-30 cross the line air motor starter for use with squirrel cage induction motors up to 20 hp., 550 and 440 volts; 15 hp., 220 volts, and 7½ hp., 110 volts. This starter is designed to prevent an arc from forming when the contacts are separated on opening the circuit. The starter has no barriers or arc chutes. It is enclosed in a pressed steel case arranged for conduit knockouts. It is furnished with electrically-operated thermal relays for time-lag overload protection and has under-voltage protection.

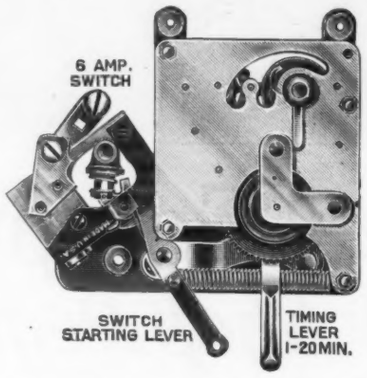


Contact Point Alloy

H. A. Wilson Co., 97 Chestnut St., Newark, N. J., has placed on the market No. 10 alloy for use in electrical contact points. It is supplied in the form of rivets, discs, wires, sheets or rods, and can also be had in any special forms to which the material lends itself by forming in dies or other mechanical treatment. It is a special alloy containing a high percentage of silver, and is designed to have better arc-resisting properties than fine silver, sterling silver or coin silver, and is harder. It is also stated that the oxidation of the alloy has no effect on its function.

Automatic Timing Device

Walser Automatic Timer Co., 342 Madison Ave., New York, is introducing a 6-ampere lever control, automatic timing device without a case. It is sold direct to manufacturers and has a 1 to 20 minute timing range. The time is first set by the timing lever, then the switch is turned on by the switch lever, which automatically starts the clock which will run until the time for which the lever has been set has expired, when the device will automatically open the circuit.



Circuit Breaker

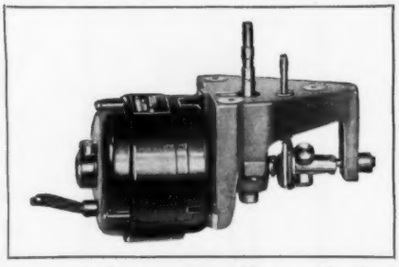
Roller-Smith Co., 233 Broadway, N. Y., is marketing Type EAF circuit breakers for the protection of motors and feeder circuits against overload and failure of voltage. These circuit breakers are of the free handle type, non-closable on overload. They are provided with barriers between poles and arc chutes. Overload coils can be replaced with coils of the same size or any other size. A direct-acting time limit resets itself instantly after the breaker opens. These breakers are made in capacities from ½ to 80 amp., 250 volts D. C. and 550 volts A. C., two and three-pole, overload and undervoltage, time limit, free handle, all fully enclosed.

Fully Enclosed Motor

Reynolds Electric Co., 2650 W. Congress St., Chicago, Ill., has brought out a fully enclosed ventilated type motor in 1/6 and ¼ hp. sizes. A terminal block is mounted inside the motor and is fully protected by the cover plate. The design is such that an outlet box fitting or an external switch can be attached in place of the cover plate. The windings are heavily insulated to make them moisture proof. The oiling system consists of an oversize oil well packed with wool yarn, and provision is made so that the surplus oil returns automatically to the well. The motor is for use on ironers, clothes washers and various other types of appliances requiring small motors.

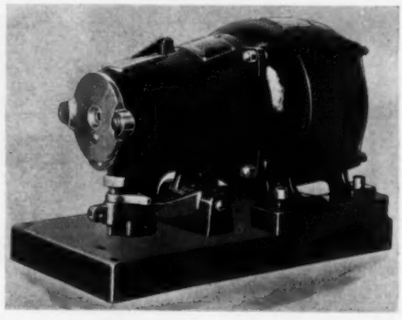
United Phonograph Motor

United Air Cleaner Co., 9705 Cottage Grove Ave., Chicago, Ill., has placed on the market the United electrically driven phonograph motor. A Century squirrel-cage type motor is used to drive it. A driving worm, pressed on the end of the motor shaft, engages with a vulcanized fiber gear on the motor shaft. One end of the governor shaft is coupled to the motor shaft with a jaw clutch, giving positive drive. The motor can be fastened to the mounting board with felt washers the same as spring motors are mounted. The electric motor can also be furnished for D.C. and for 30 and 50 cycles A.C.



Perfection Wire Stripper

Weber Machine Corp., 33 S. Water St., Rochester, N. Y., announces the Perfection Wire Stripper, a machine for removing any kind of insulation from the ends of solid, stranded tinsel, multi-conductor cable, or wire up to ½ in. in diameter. Cutting knives are circular and can be quickly replaced at a small cost. Model A machine is direct connected to motor, and will plug in any standard lamp socket.



HANDY & HARMAN
FOUNDED 1867
QUALITY SERVICE

Handy Silver Solder

Has No Counterpart

AS America's leading fabricators of precious metals, with an expert staff of metallurgists, we have been able to develop "Handy" Silver Solders to the highest degree of perfection.

Characteristics

1. High tensile strength of joints (40,000 to 60,000 lbs. per sq. in.) usually stronger than metals joined.
2. Resistance to vibration and shock
3. Resistance to operating temperatures of 1400 to 1600 deg. fahr.
4. Resistance to corrosion from either acid or alkaline enemies, or from the atmosphere.
5. High electrical conductivity.
6. Penetration. Flows freely, speeding up production So small a quantity required that the solder-cost per joint is negligible.
7. Makes neat, compact joints.
8. Color-match. Colors range from that of sterling silver to that of yellow brass —according to formula.
9. Accurate to analysis, gauge and width.

Many Electrical Uses

These characteristics render "Handy" Silver Solders admirable:

(a) For joining commutator segments.
(b) For soldering leads or other joints subject to rise in temperature above the critical point for soft solder.
(c) For joining bus bars, contactors, etc.
(d) For brazing rotor bars and end connectors on polyphase induction motors.
(e) For sealing radio or X-ray bulbs.

We Co-operate—Intelligently

We will act for you, wholeheartedly, in solving your soldering and brazing problems. A vast amount of data and the services of our specialists, are at your disposal. Write us fully—or, if the problems is immediate and troublesome, send parts.

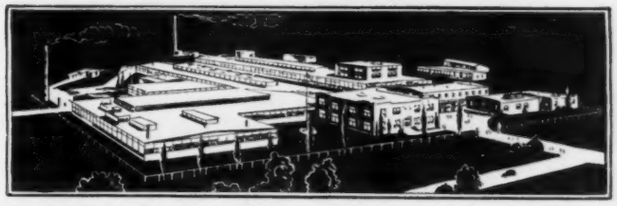
Send for our "Handy Book of Silver Solder E".

HANDY & HARMAN

General Offices—57 William St., New York City

Plants

Fulton and Gold Sts. New York — BRIDGEPORT, CONN. — 425 Richmond St. Providence, R. I.



Main Plant — *Bridgeport Conn.*

Index of Raw Materials, Parts, Electrical Equipment

For all electrical products including electrically operated machines and appliances

Trade Names—Manufacturers' Names—Local Addresses

The names of all manufacturers are grouped alphabetically under the heading for the product they manufacture. Trade names also appear in alphabetical position under the subject identifying the product. Thus "Linolac" insulating varnish will be found in alphabetical position under the heading "Paint, Varnish, Lacquer."

Note: The Classified Index of ELECTRICAL MANUFACTURING is limited to those subjects of interest to the specific field which it covers, for obvious reasons. A complete Classified Index of all electrical commodities bought, sold, or used by Electrical Supply Jobbers, Contractors, Dealers, Central Stations and other electrical industry outlets appears regularly in each issue of ELECTRICAL RECORD as heretofore. This Classified Index has been an exclusive ELECTRICAL RECORD feature for over thirty-six years.

ALLOYS, LIGHT METAL
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.

ALUMINUM
(Also Aluminum Bronze Powder.)
Albron, Alcoa, Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh.

AMMETERS. See Instruments.

ARMATURE
Balancers. See Balancers, Armature.
Banding Machines. See Banding Machines, Armature
Bearings. See Bearings.
Buggies. See Lifts, Armature.
Coil Presses. See Presses, Armature Coil.
Coils. See Coils, Finished.
Core Punchings. See Discs, Armature.
Cranes. See Lifts, Armature.
Discs. See Discs, Armature.
Driers. See Ovens.
Growlers. See Testers, Coil.
Hoists. See Lifts, Armature.
Impregnators, Vacuum. See Ovens, Industrial.
Jacks. See Lifts, Armature.
Laminations. See Discs, Armature.
Lathes. See Lathes.
Lifts. See Lifts, Armature.
New. See Coils, Finished.
Notching Machines. See Notching Machines, Armature.
Pegs. See Pegs, Armature.
Pinion Pullers. See Pullers, Armature Shaft.
Repaired. See Repairing and Second-Hand.
Shaft Pullers. See Pullers, Armature Shaft.
Shaft Straighteners. See Straighteners, Armature Shaft.
Stands. See Stands, Armature.
Test Benches. See Test Benches, Armature.
Testers. See Testers, Coil; also Test Benches, Armature.
Torpedo Cord. See Twine, Armature Winding.
Trouble Shooters. See Testers, Coil; also Test Benches, Armature.
Trucks. See Lifts, Armature.
Wedges. See Pegs, Armature.
Winding Machines. See Winding Machines, Armature & Field Coil.
Winding Twine. See Twine, Armature.

ARMATURE & COIL SPRAY GUNS. See Spraying Outfits.

ARMORING MACHINES. See Wire Manufacturing Machines.

ARMS, FLEXIBLE. See Tubing Flexible Metallic.

ASBESTOS Shades. See Shades, Fabric.
Paper & Sheet. See Asbestos.
Slabs. See Asbestos Slabs.
Tape. See Tape, Asbestos.
Wire. See Wire, Insulated.
Yarn and Thread. See Yarn and Thread.

ASBESTOS
Sheet, Paper, Mill Board, Lumber.
Asbestos, Shingle, Slate & Sheathing Co., Ambler, Pa.
Easco. See Eastern Asbestos Co.
Eastern Asbestos Co., Providence, R. I.
Ferodo & Asbestos, Inc., New Brunswick, N. J.
Johns-Manville Corp., New York, N. Y.

ASBESTOS SLABS
Slabs & Barriers for Switchboard.
Asbestos-Ebony. See Johns-Manville, Inc.
Decelco, Inc., Wayne, Mich.
Johns-Manville Corp., New York, N. Y.
Transite. See Johns-Manville, Inc.
Zolite. See Decelco, Inc.

BAGS, Vacuum Cleaner
Merrimack Mfg. Co., Boston, Mass.

BALANCERS, Armature
(Dynamic Balancing Machines—Balancing Ways).
Anderson Bros. Mfg. Co., Rockford, Ill. (Ways).
Armature Coil Equip. Co., 2415 Forestdale Ave., Cleveland, O. (Machine).
Bowsher Co., N. P., South Bend, Ind.
Olsen Testing Machine Co., Tinius, 500 N. 12th St., Philadelphia, Pa. (Machines).
Sundstrand Machine Tool Co., Rockford, Ill.
Twentieth Century. See Sundstrand Machine Tool Co.
Vibration Specialty Co., 1534 Winter, Philadelphia, Pa. (Machines).

BALL BEARINGS. See Bearings, Ball and Roller.

BANDING MACHINES, Armature
Columbia Machine Wks. & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridlon Company, Frank, Boston, Mass.

BARRIERS, Switchboard. See Slate; also Soapstone; also Asbestos.

BARS, BUS. See Brass, Bronze & Copper; also Aluminum.

BARS, Commutator
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co.
Buckeye Tempered Copper & Brass Co., Mansfield, O.
Cameron Electric Mfg. Co., Ansonia, Conn.
Commutator Co., 131 N. Front, Minneapolis, Minn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., 4743 Hough Ave., N. E., Cleveland.
Rome Brass & Copper Co., Rome, N. Y.

BASES, Radio Tube. See Radio Molded Parts.

BASES, Reading Lamp
Metal, Pottery, Wood & Glass.
American Ring Co., Waterbury, Conn.
Aladdin Mfg. Co., Muncie, Ind.

Armor Bronze Co., Garwood, N. J.
Camden Art Tile & Pottery Co., Camden, Ark.
Colonial. See Old Colony Iron Wks.
Estes & Sons, E. B., 5844 Grand Central Terminal, New
Fulper Pottery Co., Flemington, N. J.
Globe Metal Spinning Co., 178 Centre, New York, N. Y.
Hemill Products, Inc., 103 Mott, New York, N. Y.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Marbleart. See Insulation Mfg. Co.
Natural. See Insulation Mfg. Co.
Old Colony Iron Wks., Bridgeport, Conn.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sneath Glass Co., Hartford City, Ind.
Van Briggle Tile & Pottery Co., Colorado Springs, Colo
Weller, S. A., Zanesville, O. (Pottery.)
Yokel Corp., 219 Homestead Ave., Hartford, Conn.
Zane Pottery Co., South Zanesville, O.

BATTERY CHEMICALS. See Chemicals, Battery.
BATTERY CUT OUTS. See Switches, Battery.
BATTERY GAGES. See Instruments, Pocket.
BATTERY JARS. See Jars, Battery, Glass; also Rubber; also Molded Insulation.
BATTERY OXIDES. See Chemicals, Battery.
BATTERY SALTS. See Chemicals, Battery.
BEAD CHAIN. See Chain, Socket.
BEADS, Chandelier. See Crystals, Chandelier.

BEADS, Insulating
American Lava Corp., 1425 William, Chattanooga, Tenn
Dunco. See Struthers Dunn, Inc.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.

BEARINGS
Ball & Roller. See Bearings, Ball & Roller.
Graphite. See Bearings, Oil-less.
Oil-less. See Bearings, Oil-less.
Sleeve. See Bearings & Bushings.

BEARINGS, Ball and Roller
Ahlberg Bearing Co., 317 E. 29th, Chicago, Ill.
Bantam Ball Bearing Co., South Bend, Ind.
Commercial. See Schatz Mfg. Co.
C J B. See Ahlberg Bearing Co.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearing Co., Poughkeepsie, N. Y.
Gurney. See Marlin-Rockwell Corp.
Hyatt Roller Bearing Co., Newark, N. J.
Hoffman. See Norma-Hoffman Bearings Corp.
McGill Metal Co., Valparaiso, Ind.
Marlin-Rockwell Corp., Jamestown, N. Y.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
New Departure Mfg. Co., Bristol, Conn.
Nice Ball Bearing Co. (Nicetown), Philadelphia, Pa.
Norma-Hoffman Bearings Corp., Stamford, Conn.
Roller Bearing Co. of America, Whitehead Rd., Trenton.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Schubert. See McGill Metal Co.
Standard Steel & Bearings, Inc., Plainville, Conn.
Strom Bearings Co., 4587 Palmer, Chicago, Ill.
S. K. F. Industries, 40 E. 34th, New York, N. Y.
Timken Roller Bearing Co., Canton, O.
Torrington Co., Torrington, Conn.

BEARINGS, Oil-Less
Argute Oilless Bearings Co., 149 Berkeley, Philadelphia, Pa.
B. M. C. See Burlington Metal Corp.
Bogart & Hopper, Inc., 225 Varick, New York, N. Y.
Bound Brook Oil-less Bearing Co., Bound Brook, N. J.
Burlington Metal Corp., Burlington, Wis.
Cleveland Graphite Bronze Co., 880 E. 72nd, Cleveland, O
Electric Railway Equipment Co., 30 Church, New York, N Y
Elreco. See Electric Railway Equipment Co.
Graphalloy. See Graphite Metallizing Co.
Graphite Metallizing Co., Yonkers, N. Y.
Lubrite. See Merriam Bros., Yonkers, N. Y.
Merriam Bros., 185 Amory, Boston, Mass.
Metal Saw & Machine Co., Springfield, Mass.
Moraine Products Co., First & Foundry Sts., Dayton, O.
Neveroil Bearing Co., Wakefield, Mass.
Nolu Oilless Bearing Co., 6 E. Johnson, Philadelphia Pa
O. & S. Bearing Co., 315 S. Artillery, Detroit, Mich
Reliance. See Metal Saw & Machine Co.
Seib Lignum-Vitae Woodturning Co., 98 Boyd Ave., Jersey City, N. J.
United States Graphite Bearing Co., Saginaw, Mich

BEARINGS AND BUSHINGS
(For Armature Shafts.)
Adjustable Bearing Co., 101 Transportation Bldg., Indianapolis, Ind.
Ajax Metal Co., Philadelphia, Pa.
American Bronze Corp., Berwyn, Pa.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bunting Brass & Bronze Co., Toledo, Ohio.
Damascus Bronze Co., Pittsburgh, Pa.
Durex. See Moraine Products Co.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Flood City Mfg. Co., Johnstown, Pa.
Johnson Bronze Co., New Castle, Pa.
Lumen Bearing Co., Buffalo, N. Y.
Moraine Products Co., Dayton, O.
National Bearing Metal Corp. (More-Jones Brass & Metal Div.), 4930 Manchester Ave., St. Louis, Mo.
United States Graphite Co., Saginaw, Mich.

BELTING, Chain Transmission. See Chain, Power Transmission.

BELTS, Rubber
Molded Cord Rubber Belts for Electrical Appliances.
Fay Rubber Products Co., Elyria, O.
Glimer Co., L. H. (Tacony), Philadelphia, Pa.

BENDERS, Coil Loop
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

BENDING. See Punching & Bending.

BINDING POSTS. See Posts, Binding.

BLADES, Fan
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y
Torrington Mfg. Co., Torrington, Conn.

BLUESTONE. See Chemicals, Battery.

BOARD, Fuller. See Cloth and Paper.

BOARD, Press. See Cloth and Paper.

BOWL HOLDERS. See Fixture Fittings.

BOX & CABINET BUSHINGS. See Bushings, Box & Cabinet.

BOX BOARD
Container Corp. of America, 111 W. Washington, Chicago.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Fibre
Container Corp. of America, 111 W. Washington, Chicago.
Cornfibre. See Container Corp. of America.
Mid-West Box Co., 111 W. Washington, Chicago.

BOXES, Sheet Steel. See Cabinets, Sheet Steel.

BOXES, Wood. See Cabinets & Boxes, Wood.

BOXES AND WRAPPERS
Brown & Bailey Co., 417 N. Eighth, Philadelphia, Pa.
Bulldog. See Pittsburgh Corrugated Paper Box Co.
Campbell Paper Box Co., South Bend, Ind.
Consolidated Paper Co., Monroe, Mich.
Container Corp. of America, 111 W. Washington, Chicago.
Gair Co., Robert, 420 Lexington Ave., New York. (Boxes.)
Gator-Hide Kraft. See International Paper Co.
Hinde & Dauch Paper Co., 325 Decatur, Sandusky, Ohio.
Huntington Paper Box Co., Huntington, Ind.
International Paper Co., 100 E. 42nd, New York, N. Y.
Lake Lithographing Co., 2570 Superior Ave., Cleveland, O (Display Cartons.)
Mid-West Box Co., 111 W. Washington, Dept. 36, Chicago
National Folding Box Co., New Haven, Conn. (Cartons.)
Pittsburgh Corrugated Paper Box Co., Pittsburgh, Pa.
River Raisin Paper Co., Monroe, Mich.
Sefton Mfg. Co., 59 E. Madison, Chicago, Ill.
Shuttleworth Carton Co., 474 W. Broadway, New York.

BRACKETS, Instrument
For Suspending Meters to Station Switchboard.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

BRAIDING MACHINES. See Wire Manufacturing Machines.

BRASS TUBING. See Tubing, Brass and Copper.

BRASS, BRONZE AND COPPER
Sheet, Rod, Bar.
American Brass Co., 25 Broadway, New York, N. Y.
American Nickeloid Co., Peru, Ind.
Anaconda. See American Brass Co.
Baltimore Brass Co., 1212 Wicomico, Baltimore, Md.
Baltimore Copper Mills, (Div. of General Cable Corp.) Baltimore, Md.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Bohnalite. See Bohn Aluminum & Brass Corp.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn
Buffalo Bronze Die Cast Corp., 100 Arthur, Buffalo, N. Y.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Durbar. See Buffalo Bronze Die Cast Corp.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit,
Nickeloid. See American Nickeloid Co.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Seymour Mfg. Co., Seymour, Conn.
Titan Metal Mfg. Co., Bellefonte, Pa. (Rods and Forgings.)

BREAKERS, Circuit. See Circuit Breakers.

BRIDGES, Wheatstone. See Instruments, Laboratory Stand and.

BRONZE. See Brass, Bronze and Copper; also Castings

BRONZE, Phosphor. See Phosphor Bronze.

BRONZE POWDER, Aluminum. See Aluminum.

BRUSH HOLDERS. See Brushes, Commutator.

BRUSHES, Carbon. See Brushes, Commutator.
Graphite. See Brushes, Commutator.
Metal Graphite. See Brushes, Commutator.

BRUSHES, COMMUTATOR
(Brushes, Brush Holders and Flexible Leads.)
Brush Holders ..... See H
Carbon, Graphite, Metal Graphite ..... See C
Flexible Leads and Pig Tails ..... See L
Sheet Metal ..... See S
Wire Gauze ..... See W
Automotive Mfg. Co., Kansas City, Mo. ..... H
B B. B. See Becker Bros. Elec'l Corp.
Baylis Co., Bloomfield, N. J. ..... H
Becker Bros. Elec. Corp., 23 N. Jefferson, Chicago, Ill. ..... C W S H L
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y. C
Boxill-Bruel Carbon Co., Columbia Park, O. ..... C H
Calebaugh Self-Lubricating Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. C
Carbon Engrg. Co., Slinger, Wis. ..... C I
Carbon Laboratories Co., 5005 Euclid Ave., Cleveland, O. C
Carbon & Graphite Corp., 227 West Broadway, New York, N. Y. C
Carenco. See Carbon Engineering Co.

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BRUSHES, Commutator—Continued
Chapin Co., Chas. E., 227 Fulton St., New York, N. Y. ..... C W S .. L
Columbia Machine Wks., & M. I. Co., 263 Chestnut, Brooklyn, N. Y. ..... H ..
Cooley Mfg. Co., 98 Park Place, New York .. W .....
Diamond C. See Chapin Co., Chas. E.
Dixon Crucible Co., Joseph, Jersey City..... .....
Electra. See Automotive Mfg. Co.
Electric Accessories Co., 310 York Ave., Philadelphia, Pa. ..... H .
Electro-Nite Carbon Co., 308 N. Fourth, Philadelphia, Pa. .....
Eureka Copper Products Corp., North East, Pa. ..... W S H .
Fleck Carbon Co., 508 Broome, New York C ....
General Electric Co., Schenectady, N. Y.... C .... H ..
Graphalloy. See Graphite Metallizing Corp.
Graphite Metallizing Corp., 1040 Nepperhan Ave., Yonkers, N. Y. ..... C .... H ..
Henrite Products Co., 98 Park Place, New York, N. Y. ..... C .....
Holland Trolley Supply Co., 1623 E. 43rd, Cleveland, Ohio ..... H ..
Jeandron, W. J., 345 Madison Ave., New York, N. Y. (Imported.) ..... C ....
Keystone Carbon Co., 4630 N. 11th, Philadelphia, Pa. ..... C .....
Kohlenite Products Co., 417 W. 28th, New York, N. Y. ..... C .....
Le Carbone. See Jeandron, W. J.
Le Valley Vitae Carbon Brush Co., 4851 Grand Central Terminal, New York, N. Y. C .....
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich. ..... C .....
Morganite Brush Co., 23-02 48th Ave., Long Island City, N. Y. ..... C .....
National Carbon Co., Cleveland, O. ..... C .....
New Process Carbon Co., 1503 Columbia Ave., Philadelphia, Pa. ..... C L
No Spark. See Calebaugh Self-Lubricating.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, Ohio ..... C W L
Ohio Elec. Specialty Mfg. Co., Troy, O. .. W .....
Perfection Supply Co., 98 Park Pl., New York, N. Y. ..... C W S H L
Pittsburgh Carbon Brush Co., 127 Fancourt, Pittsburgh, Pa. ..... C .....
Pure Carbon Co., Wellsville, N. Y..... C W S .. L
Pyramid. See National Carbon Co.
Reaction. See Baylis Co.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y. ..... W L
Salem Electrical Supply Co., Salem, Mass. .. W .....
Seabury, Ralph L., Factories Bldg., Toledo, O. C .....
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. ..... C .....
Spee-Dee Elec. Mfg. Co., 199 Lafayette, New York, N. Y. ..... C L
Speer Carbon Co., St. Mary's, Pa. ..... C .....
Stackpole Carbon Co., St. Mary's, Pa..... C .....
Sterling. See Carbon Laboratories Co.
Superior Carbon Products Co., North Rd., Poughkeepsie, N. Y. ..... C .....
U. S. Graphite Co., Saginaw, Mich. ..... C .....
Universal. See Graphite Metallizing Corp.
Weber Elec. Wks., Brooklyn Sta., Cleveland. C L

BRUSHES, PNEUMATIC SPRAYING. See Spraying Outfits.

BRUSHES FOR VACUUM CLEANERS
Omaha Brush Co., 320 N. 15th, Omaha, Neb. (Brushes rebristled.)
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, Ohio.

BUGGIES, Armature. See Lifts, Armature.

BULBS, Glass
For Incandescent Lamps and Tubes.
Almo Mfg. Co., 38 Crawford, Newark, N. J.
Corning Glass Wks., Corning, N. Y.
Fayette Glass Bulb Co., 229 21st, Brooklyn, N. Y.
Libby Glass Co., Toledo, O.

BUNCHING MACHINES. See Wire Manufacturing Machines.

BUSHINGS, SHAFT. See Bearings and Bushings.

BUSHINGS, Box and Cabinet, Porcelain
Appleton Electric Co., 1704 Wellington Ave., Chicago, Ill.
Columbia Metal Box Co., 226 E. 144th St., New York, N. Y.
Harter. See Multi Elect. Mfg. Co.
Knox Porcelain Corp., Knoxville, Tenn.
Mineralloc Electric Co., 25 N. Peoria, Chicago, Ill.
Multi Electric Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Nelson Elec. Co., Plant City, Fla.

CABINET GRILL CLOTH. See Cloth, Untreated.

CABINETS, Fibre
Continental-Diamond Fibre Co., Bridgeport, Pa.
Vulcawood. See Continental-Diamond Fibre Co.

CABINETS, Refrigerator. See Refrigerator Cabinets.

CABINETS, Sheet Steel
Stamped and Turned-up Boxes and Cabinets.
Acme Blow Pipe & Sheet Metal Wks., New Orleans, La.
Adam Electric Co., Frank, St. Louis, Mo.
All-Steel-Equip. Co., Aurora, Ill.
American Steel Furniture Co., 27 W. 24th, New York, N. Y.
Aurora Steel Products Co., Aurora, Ill.
Benjamin Elec. Co., 1378 E. 16th, Los Angeles, Cal.
Berks Engineering Co., Reading, Pa.
Berthold Elec. Co., Geo., 535 W. Monroe, Chicago, Ill.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
C. & P. Electric Wks., Springfield, Mass.
Cleveland Switchboard Co., 2925 E. 79th, Cleveland, O.
Coast Specialty Co., 72 E. Sixth, Portland, Ore.
Cole Metal Products Co., 33 Crescent, Long Island City.
Columbia Elec. Mfg. Co., 59 Columbus Sq., San Francisco, Cal.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Columbian Steel Tank Co., 1505 W. 12th, Kansas City, Mo.
Commercial Mfg. & Supply Co., 1443 Delaware St., Denver.
Diamond Elec'l Mfg. Co., 1330 E. 16th, Los Angeles, Cal.
Dowman-Dozier Mfg. Co., 1314 Murphy Ave., S. W., Atlanta, Ga.
Electric Panelboard Co., 426 Exchange, Rochester, N. Y.
Electric Apparatus Co., 702 N. Halsted, Chicago, Ill.
Federal Steel Products Co., 2 Ave. L, Newark, N. J. (Polarized Boxes.)
Fouch Elec. Mfg. Co., 105 N. Ninth, Portland, Ore.
Greater New York Metal Box Co., Inc., 143 W. 19th, New York.
Green Elec. Co., 31 N. Water, Rochester, N. Y.
Gurney Sheet Metal Wks., 718 E. 4th, Long Beach, Cal.
Hauer, J. B., Driggs Ave. and N. 11th, Brooklyn, N. Y.
Holzer Sheet Metal Wks., Inc., New Orleans, La.
Hough Mfg. Co., 2520 24th, Detroit, Mich.
Isert Co., J. H., 1234 Rowan, Louisville, Ky.
Karp Metal Products Co., 129 30th, Brooklyn, N. Y.
Kirtland Elec. Construction Co., 34 Herkimer, Albany, N. Y.
Large-Dall Mfg. Co., 406 Cherry St., Philadelphia.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lexington Elec. Products Co., 419 E. 24th, New York, N. Y.
Lorentzen, H. K., 155 Leonard, New York, N. Y.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Mansfield Elec. Hardware Co., Longview Ave., Mansfield, O.
Metropolitan Elec. Co., 2914 First Ave., S., Seattle, Wash.
Metropolitan Elec. Products Co., Blvd. at 14th, Long Island City, N. Y.
Milwaukee Vault & Cabinet Co., 521 Market, Milwaukee.
Mosher, S. L., 1951 Lawrence, Denver, Colo.
National Metal Box Co., Van Dyke & Ferris Sts., Brooklyn.
Newman Elec. & Mfg. Co., Eau Claire, Wis.
Parr Metal Products Corp., 3519 41st, Long Island City, N. Y.
Penn Electrical Co., 35 Water, Irwin, Pa.
Powerlite Switchboard Co., 4149 E. 79th, Cleveland, O.
Rezioh. See Holzer Sheet Metal Works.
Robbins & Myers, Inc., Springfield, O.
Security. See Aurora Steel Products Co.
Standard Metal Box Corp., 950 Grand St., Brooklyn, N. Y.
Star Metal Box Co., 238 46th, Brooklyn, N. Y.
Superior Switchboard & Devices Co., 420 Schroyer Ave., Canton, O.
Tanner & Co., Wm. F., 511 S. Sharp, Baltimore, Md.
United Metal Box Co., 473 President, Brooklyn, N. Y.
United Sheet Metal Wks., 575 Howard, San Francisco
Universal Metal Box & Products Co., 316 Colt, Irvington N. J.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Wurdack Elec. Mfg. Co., 4444 Clayton Ave., St. Louis, Mo.

CABINETS AND BOXES, Wood
Ampere. See Donehue Lumber Co.
Aston Cabinet Mfrs., 1223 W. Lake, Chicago, Ill.
Boehm Cabinet Co., J., 2216 W. 63rd St., Cleveland, O.
Buckeye Mfg. Co., Springfield, O.
Carolina Wood Products Co., Asheville, N. C.
Carrom Co., Ludington, Mich.
Caswell-Runyon Co., Huntington, Ind.
Cheney Piano Action Co., A. C., Castleton, N. Y.
Clinton Corp., 342 Madison Ave., New York, N. Y.
Corlieth Cabinet Mfg. Co., St. Mary's, Pa.
Cory Cabinet Corp., Springfield, Mo.
Deiker Co., Geo., Henderson, Ky.
Donehue Lumber Co., Smith and State, Perth Amboy, N. J.
Ebert Furniture Co., 225 W. 34th, New York, N. Y.
Eflein & Sons, Frederick, 44 Central Ave., Brooklyn, N. Y.
Empire-United Hat Block Co., 312 E. 22nd, New York.
Estes & Sons, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Excello Products Corp., 4836 W. 16th, Cicero, Ill.
Findlay Mfg. Co., Metropolitan & Morgan Aves., Brooklyn.
Grand Rapids Furniture Co., Grand Rapids, Mich.
Harper Mfg. Co., Cassopolis, Mich.
Hickory Box Co., Hickory, N. C.
Hubbell, H. L., 59 Market Ave., N. W., Grand Rapids.
Interstate Woodworking Co., 46 Wooster, New York, N. Y.
Karpen. See Studner Bros.
King Mfg. Corp., Rano & Crowley, Buffalo, N. Y.
Klumpp Sons, John G., 13 Baxter, New York, N. Y.
National Cabinet Co., New Philadelphia, O.
New England Box Co., Greenfield, Mass.
Oneida Cabinet Corp., Oneida, N. Y.
Ottawa Furniture Co., Holland, Mich.
Pooley Co., 16th & Indiana Ave., Philadelphia, Pa.
Radio Allied Mfrs. Corp., 1340 S. Michigan Ave., Chicago.
Radio Cabinet Mfg. Corp., Furniture Mart, Chicago, Ill.
Radio Cabinet & Equipment Co., 1504 Vine, Philadelphia
Radio Mfg. Co., Div. of Pillied Lumber Co., Swanton, O.
Radio Master Corp., Bay City, Mich.
Red Lion Cabinet Co., Red Lion, Pa.
R. E. Z. Cabinet Co., 54 North, Boston, Mass.
Rockford Sales Corp., 206 Lexington Ave., New York, N. Y.
Schutz Bros., 152 Chambers, New York, N. Y.
Signal Elec. Mfg. Co., Menominee, Mich.
Southern Toy Co., Hickory, N. C.
Specialty Display Case Co., Kendallville, Ind.
Stradivara Co., Coshocton, Ohio.
Stedtner Phonograph Corp., 318 E. 75th, New York.
Studner Bros., 67 W. 44th, New York, N. Y.
Superior Cabinet Corp., 206 Broadway, New York, N. Y.
Syracuse Screen & Grille Co., North Manchester, Ind.
Tessier Bros., 355 Bridge, Northampton, Mass. (Radio.)
Trenton Wood Specialty Co., Stokes Ave. and P. R. R., Trenton, N. J.
Udell Wks., 28th and Barnes Ave., Indianapolis, Ind.
West Box Co., 235 Liberty, Springfield, Mass.

CABLE ARMORING MACHINES. See Wire Manufacturing Machines

CABLE TEST SETS. See Instruments, Portable and Switchboard.

CABLING MACHINES. See Wire Manufacturing Machines.

CANDLES, Fixture
Glass, Fibre Paper.
Brandywine Fibre Products Co., 1402 Walnut, Wilmington,
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Fibre Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., 173 Lafayette, New York, N.Y.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Seamless. See Fibre Products Co.

CANOPY (Canopies). See Fixture Fittings.
Insulators. See Insulators.
Switches. See Switches, Snap.

CAPACITORS, RADIO. See Radio Circuit Components.

CARBON, Powdered
Marks Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich.

CARBONS, Battery. See Carbons.
Arc Light. See Carbons.

CARBONS
Battery Arc Light.
Becker Bros. Elect. Corp., 23 N. Jefferson, Chicago, Ill.
Blanck & Carrier Corp., 115 W. 63rd, New York, N. Y.
Columbia. See National Carbon Co.
Daylight. See National Carbon Co.
Lessing Battery. See Blanck & Carrier Corp.
Nuernberg Battery. See Blanck & Carrier Corp.
National Carbon Co., Cleveland, Ohio.
Oretip. See National Carbon Co.
Silvertip. See National Carbon Co.
Speer Carbon Co., St. Mary's, Pa.
Stackpole Carbon Co., St. Mary's, Pa.

CARTONS. See Boxes and Wrappers.

CASEIN PLASTICS. See Molded Insulation.

CASES, Eliminator. See Cases, Eliminator.
Flashlight. See Cases, Flashlight.

CASES, Eliminator
Brumberger Co., 252 Pearl, New York, N. Y.
Grand Sheet Metal Wks., 176 Grand, New York, N. Y.
Karp Metal Products Co., 129 30th, Brooklyn.
Luna Tin Mfg. Co., 547 W. 21st, New York, N. Y.

CASES, Flashlight
Bridgeport Brass Co., 744 E. Main, Bridgeport, Conn.
Lincoln Fibre Specialty Co., Newport, Del.
St. Louis Paper Can & Tube Co., St. Louis, Mo.
Underwood Battery Co., 1250 Ontario, Cleveland, O.

CASTINGS, Aluminum. See Castings, Aluminum. Also Castings, Copper, etc.
Brass. See Castings.
Bronze. See Castings.
Copper. See Castings.
Die. See Castings, Die.
Monel Metal. See Castings.
Steel. See Castings, Steel.
White Metal. See Castings.

CASTINGS, Aluminum
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Bohm Aluminum & Brass Corp., Detroit, Mich.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Monarch Aluminum Ware Co., 9301 Detroit Ave., Cleveland.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland O.
Quality Aluminum Casting Co., Waukesha, Wis.
Steel. See National Bronze & Aluminum Foundry Co.
Veco Mfg. Co., South Norwalk, Conn.

CASTINGS
Copper, Brass, Bronze, Monel Metal, White Metal.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Bohn Aluminum & Brass Corp., Detroit.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
Central Pattern & Foundry Co., 3737 S. Sacramento Ave., Chicago, Ill.
Chase Brass & Copper Co., Waterbury, Conn.
Davies Mfg. Co., Decatur, Ill.
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
McGill Metal Co., Valparaiso, Ind.
National Bronze & Aluminum Foundry Co., 88th & Lazy, Cleveland, O.
Ohio Pattern Wks. & Fdy. Co., 2730 Spring Grove Ave., Cincinnati, O.
Rabun Bronze Foundry, 617 West Belgrave, Huntington Park, Cal.
Sterling Art Metal Wks., 40 Purvis, Long Island City, N. Y.
Tenual. See National Bronze & Aluminum Foundry Co.

CASTINGS, Die
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee, Wis.
Alemite Die-Casting & Mfg. Co., 2640 Belmont Ave., Chicago, Ill.
Allied Die-Casting Corp., Long Island City, N. Y.
Alumac. See Aluminum Co. of America.
Aluminum Co. of America, 2471 Oliver Bldg., Pittsburgh.
Aluminum Industries, Inc., 2438 Beekman, Cincinnati, O.
American Die Casting Co., 2040 Dominick, Chicago, Ill.
Badger Die Casting Co., 156 East Buffalo, Milwaukee, Wis.
Barnhardt Bros. & Spindler, Monroe & Throop St., Chicago.
Bohn Aluminum & Brass Corp., Detroit, Mich.
Do-Di. See Doehler Die Casting Co.
Doehler Die Casting Co., 386 Fourth Ave., New York, N. Y.

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Manufacturers,who suspect that their production details are too complicated in the light of present-day demands in performance and price, are invited to investigate the advantages of Stewart Die Casting Process as applied to their requirements.

Stewart

THE STEWART DIE CASTING CORPORATION

4500 Fullerton Avenue, Chicago, Illinois

Detroit • Pittsburgh • Dayton • St. Louis
Newark • Cleveland

EM 4-Gray

CASTINGS, Die—Continued
Federal-Mogul Corp., Shoemaker & Lillibridge Sts., Detroit.
Franklin Die Casting Corp., 826 Gifford, Syracuse, N. Y.
Illinois Die Castings Co., 503 S. Jefferson, Chicago, Ill.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Milwaukee Die Casting Co., 289 Fourth, Milwaukee, Wis.
Newton Die Casting Corp., 146 Munson, New Haven, Conn.
Paragon Die Casting Co., 3221 Ravenswood Ave., Chicago, Ill.
Perfection Die Casting Corp., 406 Lakeside Ave., N. W., Cleveland, O.
Permite. See Aluminum Industries, Inc.
Soss Mfg. Co., Roselle, N. J.
Stewart Die Casting Co., 4500 Fullerton Ave., Chicago, Ill.
Superior Die Casting Co., 875 E. 70th, Cleveland, Ohio.
Twin City Die Castings Co., Talmadge and 33rd Aves., S. E., Minneapolis, Minn. (White Metal).

CASTINGS, Gray Iron
American Engineering Co., Philadelphia, Pa.
Athens Foundry Co., Athens, Pa.
Barlow Foundry Co., 551 N. J. R. R. Ave., Newark, N. J.
Barnett Foundry Co., Newark, N. J.
Bonnell Elec. Mfg. Co., 192 Chambers, New York, N. Y.
North Wales Mach. Foundry Co., North Wales, Pa.
Sacks Iron Foundry, L., 357 Wilson Ave., Newark, N. J.
Snead & Co., Pine St., Jersey City, N. J.
St. Louis Malleable Castings Co., 7701 N. Conduit Ave., St. Louis, Mo.

CASTINGS, Steel
Bonney-Floyd Co., Columbus, Ohio.
Eastern Steel Casting Co., Ave. L & Edward St., Newark.
Pittsburgh Malleable Iron Co., Pittsburgh, Pa.
Riverside Steel Casting Co., Jacobus Ave., Kearney, N. J

CEMENT, Commutator
Armstrong. See Electric Power Maintenance Co.
Conductalute. See Technical Products Co.
Early, Edward E., 1129 W. Fifth, N. W., Canton, O.
Electric Power Maintenance Co., 21 N. Third, Minneapolis.
Imperial. See Martindale Electric Co.
Martindale Electric Co., 1355 W. Fourth, Cleveland, O.
Mitchell Rand Mfg. Co., 19 Vesey, New York, N. Y.
Perce-Lute. See Perfection Supply Co.
Perfection Supply Co., 98 Park Pl., New York, N. Y.
Plas Mica Co., 26 St. Andrews Place, Yonkers, N. Y.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

CEMENT, Liquid Porcelain
Anchorlute. See Technical Products Co.
Fire Lute. See Technical Products Co.
Inss-Lute. See Technical Products Co.
Okonite Co., Passaic, N. J.
Repairet Mfg. Co., Milwaukee, Wis.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa.
Thermoid. See Technical Products Co.
CHAIN, Chandelier (Fancy). See Crystals, Chandelier.
CHAIN DRIVES. See Chain, Power Transmission.

CHAIN, Fixture
Acco. See American Chain Co.
American Chain Co., Bridgeport, Conn.
Chase Brass & Copper Co.
Eastern Chain Works, 309 E. 22nd St., New York, N. Y.
Faries Mfg. Co., Decatur, Ill.
Globe Metal Mfg. Co., 2122 E. Hazard, Philadelphia, Pa.
H. & O. Chain Co., So. Norwalk, Conn.
Newark Metal Mfg. Co., 22 S. 6th, Newark, N. J.
Plume & Atwood Mfg. Co., Waterbury, Conn.
Rodale Mfg. Co., 260 Hudson, New York, N. Y.
Steele & Johnson Mfg. Co., Waterbury, Conn.
Universal Metal Chain Co., 75 Clymer, Brooklyn, N. Y.

CHAIN, Power Transmission
Baldwin Chain & Mfg. Co., Worcester, Mass.
Boston Gear Wks. Sales Co., Norfolk Downs, Mass
Diamond Chain & Mfg. Co., Indianapolis, Ind.
Link-Belt Company, 910 S. Michigan Ave., Chicago, Ill.
Morse Chain Co., Ithaca, N. Y.
Ramsey Chain Co., Inc., Albany, N. Y.
Reeves Pulley Co., Columbus, Ind.
Renold Boston. See Boston Gear Wks.
Union Chain & Mfg. Co., Sandusky, O.
Whitney Mfg. Co., Hartford, Conn.

CHAIN, Socket
American Ball Chain Works, 13 Wooster St., New York.
Bead Chain Mfg. Co., Bridgeport, Conn.
H. & O. Chain Co., South Norwalk, Conn.
CHANDELIER BEADS. See Crystals, Chandelier.
CHANDELIER CRYSTALS. See Crystals, Chandelier.
CHANDELIER FRINGE. See Crystals, Chandelier.

CHARGERS, Magnet
Charging, Remagnetizing.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Cowie Elec. Co., E. S., 1823 Wyandotte, Kansas City, Mo.
Fore Elec. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago.
Valley Electric Co., 4221 Forest Park Blvd., St. Louis, Mo.

CHEMICALS, Battery
Electrolyte, Battery Salts, Battery Oxides, Sal Ammoniac, Bluestone, Manganese.
Cooper & Co., Charles, 194 Worth, New York, N. Y.
Eagle-Picher Lead Co., 134 N. LaSalle, Chicago. (Oxide.)
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Electro Chemical Co., 113 W. Court St., Dayton, O.
General Metallic Oxides Co., Jersey City, N. J.
Globe Chemical Co., Murray Bd. and Big Four R. R., Cincinnati, O.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Kalbfleisch Corp., 200 5th Ave., New York, N. Y.
Klipstein Co., 644 Greenwich, New York, N. Y.
Merrimac Chemical Co., 148 State, Boston, Mass.
Powers-Weightman-Rosengarten Co., Philadelphia, Pa.
Voltah. See Powers-Weightman-Rosengarten Co.
Wah Chang Trading Corp., 233 Broadway, New York, N. Y.

CHEMICALS, Refrigeration
Ansul Chemical Co., Marinette, Wis.
Arctic. See Roessler & Hasslacher Chemical Co.
Carbide & Carbon Chemicals Corp., 30 E. 42nd, New York, N. Y. (Butane & Isobutane.)
Dry Ice Corp. of America, 50 E. 42nd, New York, N. Y.
Roessler & Hasslacher Chemical Co., 709 Sixth Ave., New York, N. Y. (Methyl Chloride, Ethyl Chloride.)
Virginia Smelting Co., West Norfolk, Va. (Sulphur Dioxide.)
Chromium Plating. See Plating & Finishing.

CHUCKS, Magnetic
J & H Elec. Co., 161 Clifford, Providence, R. I.
Simmons. See Taft-Pierce Mfg. Co.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S. (Rockdale), Worcester, Mass.

CIRCUIT BREAKERS
Air and Oil Circuit Breakers and Oil Break Switches.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson Mfg Co., Albert & J. M., 289 A, Boston, Mass.
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Automatic Switch Co., 517 E. Larned, Detroit, Mich.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.

SUNDH Control
for
AC and DC
Elevator Control
Fire Pump Control
Pressure Regulators
Float Switches
Automatic Starters
Manual Starters
Speed Regulators
Machine Tool Control
Magnet Operated Switches
Valves, Magnet Operated
Transfer Switches
SUNDH
TRADE MARK
Sundh Electric Co., Inc.
Newark, N. J.

Crambiett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart & Hegeman Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
High Tension Elecl. Specialty Co., 500 Washington, Abington, Mass.
Hitesco. See High Tension Elecl. Specialty Co.
H. & H. See Hart & Hegeman Div.
Inducto-therm. See Allen-Bradley Co.
I. T. E. Circuit Breaker Co., 19th and Hamilton Sts., Philadelphia, Pa.
Line Material Co., South Milwaukee, Wis. (Oil Switches.)
Maple Co., R. H., Indianapolis, Ind.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.
Minimarket. See Burke Controller Co.
Roller-Smith Co., 289 Broadway, New York, N. Y.
Sentinel. See Westinghouse Elec. & Mfg. Co.
Takamine Corp., 308 Rawson, Long Island City, N. Y.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam.
U-Re-Lite. See I. T. E. Circuit Breaker Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh Pa
CIRCUIT TESTERS. See Testers, Fuse and Circuit
CLEANER BAGS, Vacuum. See Bags, Vacuum Cleaner
CLEANER BRUSHES, Vacuum. See Brushes for Vacuum Cleaners.

CLEANERS, Metal
Oakite Products, Inc., 26 Thames, New York, N. Y.
CLIPS, Fuse. See Fuse Clips.

CLIPS, Heater Plug
Gray Bros. Co., Piano, Ill.
CLOCK SWITCHES. See Switches, Time.
CLOTH GEARS. See Gears and Pinions, Composition.
CLOTH LOUD SPEAKER DIAPHRAGM. See Cloth, Untreated.
CLOTH RADIO GRILL. See Cloth, Untreated.

CLOTH, Untreated
Boyle & Co., John, 112 Duane, New York, N. Y.
Canvas, "Aeroplane Cloth," Cotton Duck, Drill, Diaphragm Cloth, Grill Fabrics, etc
Findall Fabrics Corp., 200 Madison Ave., New York, N. Y. (Grill Cloth).

CLOTH AND PAPER, Insulating

Cloth, Insulated	See C						
Paper, Insulated	See P						
Fibre Paper (Fish Paper)	See F						
Press Board (Fuller Board)	See B						
Silk	See S						
Acme Wire Co., New Haven, Conn.	C	S	P	.	.	.	
Armco. See Rogers Paper Mfg. Co.							
Armatite. See Mica Insulator Co.							
Brand & Co., William, 268 4th Ave., New York	.	.	P	.	.	.	
Carboloid Products Corp., 15 Park Row, New York, N. Y.	C	.	P	.	.	.	
Case Brothers, Inc., Highland, Park, Conn.	.	.	P	.	.	B	
Case Mfg. Co., Unionville, Conn.	.	.	P	.	.	.	
Case & Risley Press Paper Co., Oneco, Conn.	.	.	.	.	.	.	
Celoron Co., Bridgeport, Pa.	.	.	.	F	F	B	
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.	C	.	.	.	.	.	
Continental-Diamond Fibre Co., Bridgeport, Pa.	.	.	P	.	.	.	
Dexstar. See Dexter & Sons.							
Dexter & Sons, C. H., Windsor Locks, Conn. (Condenser Tissue.)							
Dielectric Mfg. Co., St. Louis, Mo.	C	S	P	.	.	B	
Electrite. See West Virginia Pulp & Paper Co.							
Fyberoid. See Wilmington Fibre Specialty Co.							
General Electric Co., Section I-483, Merchandise Dept., Bridgeport, Conn.	C	.	P	.	.	.	
Hartford City Paper Co., Hartford City, Ind. (Glasmine Condenser Tissue).							
Hewitt & Bros., C. B., 16 Ferry, New York	C	.	P	.	.	.	
Hi-Tex. See Stevens Paper Mills.							
Incella. See Tarentum Paper Mills Co.							
Irvington Varnish & Insulator Co., Irvington, N. J.	C	S	P	.	.	.	
Manning Paper Co., J. A., Troy, N. Y.	.	.	.	.	.	B	
Mica Insulating Co., 200 Varick, New York	C	S	P	.	.	B	
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.	.	.	P	.	.	.	
National Vulcanized Fibre Co., Wilmington, Del.	.	.	.	.	F	.	
New Jersey Wood Finishing Co., Woodbridge, N. J.	C	.	.	.	.	.	
Ohmoid. See Wilmington Fibre Specialty Co.							
Old Hick. See Hewitt & Bros., C. B.							
Peerless. See National Vulcanized Fibre Co.							
Rogers Fibre Co., 310 Lincoln, Boston, Mass.	.	.	.	.	F	.	
Rogers Paper Mfg. Co., South Manchester, Conn.	.	.	.	.	.	B	
Schweitzer, Inc., Peter J., 200 Fifth Ave., New York, N. Y. (Condenser Tissue.)	.	.	.	.	.	.	
Scutan Co., 342 Madison Ave., New York	.	.	.	P	.	.	
Sico. See Standard Insulation Co.							
Standard Insulation Co., Rutherford, N. J.	C	S	P	.	.	.	
Sterling Fireboard Co., 501 Fifth Ave., New York. (Varnished Hard Fibreboard)	.	.	.	.	.	B	
Sterlite. See Sterling Firebrand Co.							
Stevens Paper Mills, Windsor, Conn.	.	.	.	.	.	B	
Tarentum Paper Mills Co., Tarentum, Pa.	.	.	.	P	.	.	
Turbonite. See Brand & Co., Wm.							
Union Mills Paper Mfg. Co., New Hope, Pa.	.	.	.	P	.	.	
Warren Mfg. Co., 342 Madison Ave., New York, N. Y.	.	.	.	P	.	.	
West Virginia Pulp & Paper Co., 200 5th Ave., New York	.	.	.	.	.	B	
Wilmington Fibre Specialty Co., Wilmington, Del.	.	.	P	.	.	.	

CLUTCHES, Magnetic
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.

COIL (Coils).
Armature and Field. See Coils, Finished.
Choke (Power). See Fittings, High Tension.
Choke (Radio). See Radio Circuit Components.
Driers & Impregnators. See Ovens.
Electromagnet. See Coils, Finished.
Flatteners. See Rolls, Coil Flattening.
High Frequency. See Electro-Therapeutic; also Radio Circuit Components; also Ignition Outfits.
Impregnators, Vacuum. See Ovens, Industrial.
Induction. See Coils, Finished; also Electro-Therapeutic.
Loop Benders. See Benders, Coil Loop.
Medical. See Electro-Therapeutic.
Presses. See Presses, Armature Coil.
Radio. See Radio Circuit Components.
Removers. See Removers, Coil.
Resistance. See Units, Rods & Grids; also Radio Circuit Components.
Shaping Machines. See Shaping Machines, Coil.
Spark. See Ignition Outfits.
Spreaders. See Winding Machines, Armature & Field Coil.
Taping Machines. See Taping Machines, Coil.
Tesla. See Ignition Outfits.
Testers. See Testers, Coil; also Test Benches, Armature.
Winders, Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Winders, Induction Coil. See Winding Machines, Industrial Coil.
Winding Forms. See Forms, Coil Winding.
Windings (Magneto). See Coils, Finished.
Wire Tension Devices. See Tension Devices, Coil Wire.

COILS, Finished
Armature, Field, Electromagnet and Induction Coils.
Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aero-Call. See Aero Products, Inc.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Auth Electrical Specialty Co., 422 E. 53rd St., New York, A. & A. See Electrical Coil Winding Co.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Bunnell & Co., J. H., 32 Park Place, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cameron Elec. Mfg. Co., Ansonia, Conn.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Easton Coil Co., Easton, Pa.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electrical Coil Winding Co., 27th & Sanderson Sts., Camden,
Electrical Products Mfg. Co., Providence, R. I.
Fredericks Co., H. M., Lock Haven, Pa.
Globe Technolian Corp., Reading, Mass.
Herald Electric Co., 29 East End Ave., New York, N. Y.
Marion Elec. Mfg. Co., 24 Cliff, Jersey City, N. J.
Modern Elec Mfg. Co., 312 Mulberry, Toledo, Ohio.
National Elec. Corp., 226 High, Newark, N. J.
Pifer Elec. Repair & Mfg. Co., 3610 Superior Ave., Cleveland, O.
Polymet Mfg. Co., 599 Broadway, New York, N. Y.
Robertson-Davis Co., 361 W Superior, Chicago, Ill.
Robertson, Leo F., 536 West 22nd St., New York, N. Y.
Rome Wire Co. (Div of General Cable Corp.), Rome, N. Y.
Sevisur Magneto Engrg Co 397 Phillips, Toledo, O.
Stuns & Barron, 210 E. Pratt, Baltimore, Md.
Toledo Standard Commutator Co 2242 Smead Ave., Toledo, O
Universal Winding Co., Boston, Mass.
Varley Duplex Magnet Co., 15 Exchange Place, Jersey City, N. J. (Electromagnetic only).
Whittier & Dittmar Inc., 1611 Beacon Brookline, Mass.

COMMUTATOR
Bars. See Bars, Commutator.
Cement. See Cement, Commutator.
Dressers. See Stones, Commutator.
Lubricants. See Compounds, Commutator.
New. See Commutators.
Refilled. See Repairing and Second Hand.
Slotters. See Slotting Machines & Tools, Commutator.
Slotting Files. See Files, Commutator Slotting.
Soldering Machines. See Soldering Machines, Commutator.
Stones. See Stones, Commutator.
Tighteners. See Tighteners, Commutator.
Truing Devices. See Tools, Commutator Truing.

COMMUTATORS
Derby Commutator Co., Derby, Conn.
Eureka Copper Products Corp., North East, Pa.
Homer Commutator Co., Cleveland, Ohio.
COMMUTATOR BRUSHES. See Brushes, Commutator.
COMPOSITION PULLEYS. See Pulleys, Composition.
COMPOUNDS, Sealing. See Wax and Compounds.

CONDENSER UNITS, Refrigerator
Bush Mfg. Co., Hartford, Conn.
McCord Radiator & Mfg. Co., Riopelle & E. Grand Ave., Detroit, Mich.
Rome-Turney Radiator Co., Rome, N. Y.
CONDENSERS, Radio. See Radio Circuit Components.
CONDENSER TUBING. See Tubing, Brass and Copper

CONNECTORS, Pin-Plug
Kliegl Bros. Universal Electric Stage Ltg. Co., 321 W. 50th, New York, N. Y.
CONTACT POINTS. See Points, Contact.
CONTAINERS, Shipping. See Fibre Board Products.

CONTROLLERS, Motor
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Anderson & Co., C. J., 212 W. Austin, Chicago, Ill.
Automatic Switch Co., 154 Grand, New York, N. Y.
Betts, Inc., James H., 1393 Sedgwick Ave., New York, N. Y. (Traffic.)
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
B-Q Oil Burner Co., Stockton, Cal.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Condit Elec'l Mfg. Corp., 838 Summer St. (South Boston), Boston, Mass.
Cutler-Hammer Mfg. Co., 1288 St. Paul Ave., Milwaukee.
Diamond Elecl. Mfg. Co., 1330 N. 16th, Los Angeles, Cal.
Dinkey. See Elec. Controller & Mfg. Co.
E C & M Youngstown. See Electric Controller & Mfg. Co.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electrite. See Sundh Elec. Co.
General Electric Co., Schenectady, N. Y.
Horni Signal Mfg. Corp., 515 Greenwich, New York.
Industrial Controller Div of Square D Co., S. Pierce & Hanover, Milwaukee, Wis.
Malmin Speed Control Corp., 251 W. 19th, New York. (Sewing Machines.)
Monitor Controller Co., 51 Gay, Baltimore, Md.
National Electric Controller Co., 5315 Ravenswood Ave., Chicago, Ill.
Refrigerating Specialties Co., 728 S. Sacramento Blvd., Chicago, Ill.
Reostio. See Allen-Bradley Co.
Rowan Controller Co., 306 N. Holliday, Baltimore, Md
Square D Co 6060 Rivard, Detroit, Mich.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J
Switcholone. See Condit Elec. Mfg. Co.
Thermaload. See Monitor Controller Co.
Trumbull Electric Mfg. Co., Plainville, Conn.
Uemco. See Union Elec. Mfg. Co.
Unelec. See Union Elec. Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
W. K. See Westinghouse Elec. & Mfg. Co.
COPPER. See Brass, Bronze and Copper; also Castings.
COPPER TUBING. See Tubing, Brass and Copper.
CORD TIPS. See Tips, Cord.

To get the best moldings, start on them early

WHEN there is mason work, roofing or millwright work to be done about the plant, you want it done right.

The service work on your car, the investigation of your rights in that piece of property you helped to inherit, the reshafting of the best club in your golf bag—all got to be *right*.

You have to wait for the right mason, roofer or millwright. They're busy. The automobile repairmen make you wait, your lawyer does, and the golf professional makes you *like* waiting.

But you learned long ago that a hundred wrongs are not worth a single right. It pays you to get the right work.

So likewise in getting moldings. You want good moldings—actually, excellent moldings, that are not easily made. A great deal will depend on them —your customers' confidence in you included.

International molding service is the kind you want. You'll get better molding, and all it means to you along with it. But here too it is well to start work early. For International generally is running at full capacity, and much of the time working day and night.

International molding service is complete. Making your molds, producing all metal inserts, the assembling and molding—all handled on one order and under our own roofs. Estimates gladly made for you without obligation.

PRECISION MOLDERS OF BAKELITE AND SHELLAC COMPOSITION

INTERNATIONAL INSULATING CORPORATION

Division of The General Industries Co.

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Lining for Fan Bases
Lining for Lamp Bases
Packing for Radio Trade

WESTERN FELT WORKS

4029-4133 Ogden Ave., Chicago
NEW YORK DETROIT CLEVELAND ST. LOUIS

CORES, RESISTANCE COIL (Lava)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Crescent. See M. Kirchberger & Co.
Ea-El-Co. See Southern Lava Co.
Kirchberger & Co., M., 1425 37th, Brooklyn, N. Y.
Lavite. See Steward Mfg. Co.
Lavarock. See M. Kirchberger & Co.
Southern Lava Co., Rossville, Ga.
Steward Mfg. Co., D. M., Chattanooga, Tenn.
Tennessee Burner Mfg. Co., Chattanooga, Tenn.
XL. See Tennessee Burner Mfg. Co.

CORES, RESISTANCE COIL (Refractory Porcelain)

American Lava Corp., 1425 William, Chattanooga, Tenn.
Colonial Insulator Co., Akron, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Elemite. See Louthan Mfg. Co.
Fireite. See Hartford Faience Co.
Hartford Faience Co., Hartford, Conn.
Louthan Mfg. Co., E. Liverpool, O.
Thermal Syndicate, 58 Schenectady Ave., Brooklyn, N. Y.
Vitreosil. See Thermal Syndicate.
Woolley, Inc., W. Douglas, East Liverpool, O.

COTTON DUCK. See Cloth, Untreated.
COTTON SLEEVING. See Tape, Cotton.
COUNTERS, Revolution. See Tachometers.

COUPLINGS, Shaft (Flexible-Insulated)

Bartlett Hayward Co., Baltimore, Md.
Bond Co., Charles, 617 Arch, Philadelphia, Pa.
Delbee Rubber Co., Syracuse, N. Y.
Falk Corp., Milwaukee, Wis.
Franke. See Smith & Serrell.
General Electric Co., Schenectady, N. Y.
Grundy. See Bond Co.
Krone-Seebek Die Casting & Mfg. Co., 2935 W. 47th, Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Lovejoy Tool Wks., 319 W. Ohio, Chicago, Ill.
Mather. See Bond Co.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Oneida. See Delbee Rubber Co.
Smith & Serrell, 24 Washington Pl., Newark, N. J.
Webster Mfg. Co., 1856 N. Kostner Ave., Chicago, Ill.
Wood's Sons Co., T. B., Chambersburg, Pa.

COVERING MACHINES, WIRE. See Wire Manufacturing Machines.

CUPS, Grease

Bowen Products Corp., Auburn, New York.
Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.
Lunkenheimer Co., Cincinnati, Ohio.

CUPS, Oil

Gits Bros. Mfg. Co., 1960 S. Kilbourn Ave., Chicago, Ill.

CUT OUTS, Battery. See Switches, Battery.
CUTTING OUTFITS, Metal. See Welding and Cutting Outfits.
CRANES, Floor. See Lifts, Armature.

CRYSTALS, Chandelier

Crystals, Prisms, Beads, Chains, Fringes.
Crystal Venezia. See Harrison & Co., Arthur.
Friedlaender Co., 49 W. 23rd, New York, N. Y.
Harrison & Co., Arthur, 561 W. Washington Blvd., Chicago.
Hirschberg, Shutz & Co., 268 4th Ave., New York, N. Y. (Fringes.)
Nelson Bead Co., 15 W. 37th, New York, N. Y. (Importer.)
Rialto Import Co., 112 W. 4th, New York, N. Y.
Schwartz Lighting Fixture Wks., 1341 Noble, Philadelphia
Wyle & Bros., J. J., 20 E. 27th, New York, N. Y.

CURRENT INDICATORS. See Instruments, Pocket.
DASHBOARD METERS. See Instruments, Portable and Switchboard.

DECALCOMANIA

Meyercord Co., 133 W. Washington, Chicago, Ill.
Novar. See Palm Fechteler & Co.
Palm Fechteler & Co., 67 5th Ave., New York, N. Y.

DIALS

Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Enameled. See Dials, Enameled.

DIALS, Enameled

Whittier Co., Horace R., Pequabuck, Conn.

DIAPHRAGM, Cloth. See Cloth, Untreated.
DIE CASTINGS. See Castings, Die.
DIE MAKERS. See Dies, Die Makers.

DIE SETS

Baumbach Mfg. Co., 1810 Kilbourn Ave., Chicago, Ill.
Danly Machine Specialties, Inc., 2104 S. 52nd Ave., Chicago, Ill.

DIES, Pipe. See Stocks, Dies and Reamers.

DIES, DIE MAKERS

Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Mareck & Nebel, 255 Greenwich, New York, N. Y.

DISCS, Armature

Steel Discs, Laminations, and Segments for Motors and Transformers.
American Stamping Co., 978 E. 64th, Cleveland, O.
Cleveland Armature Works, 4732 St. Clair Ave., Cleveland
Hercules Elec. Steel Corp., 145 Lafayette, New York, N. Y.
Lamination Stamping Co., 764 Windsor, Hartford, Conn.

DRAWING MACHINES, WIRE. See Wire Drawing Machines.
DRIVE SCREWS. See Screws, Drive.
DRIVES, CHAIN. See Chain, Power Transmission.

DYNAMOMETERS

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Diehl Mfg. Co., Elizabeth, N. J.
General Electric Co. Schenectady,

EBONITE. See Rubber, Hard.
ELECTROLYTE. See Chemicals, Battery.
ELECTROMAGNETS. See Coils, Finished.

ELECTRODES FOR GAS SIGNS

American Neon Light & Sign Corp., 625 Sixth Ave., New York, N. Y.
Eisler Engineering Co., 756 S. 13th, Newark, N. J.
Manhattan Elect. Supply Co., 190 Sixth Ave., New York,

ELECTRODYNAMOMETERS. See Instruments, Laboratory Standard.
ELEMENTS, Heating. See Units, Rods and Grids.

ENAMELING MACHINES (For Magnet Wire)

(See Also Wire Manufacturing Machines).
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.

ENGRAVING MACHINES

Portable Bench and Pedestal Outfits for Marking Metal.
Brewster Co., Wm., 30 Church, New York, N. Y.
Deckel. See Preis & Co., Inc., H. P.
Ensravograph Corp., 12 Vestry, New York, N. Y.
Etchograph. See Brewster Co., Wm.
Gilbert Supply Co., Independence, Iowa.
Gorton Machine Co., Geo., Racine, Wis.
Preis & Co., Inc., H. P. Newark, N. J.

ENGRAVING, Radio Panel

Engraving to Order.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa
Eisler Engineering Co., 756 S. 13th, Newark, N. J. (Tube Base Branders).
Etch-O-Gravure. See Insuline Corp. of America.
General Fabricating Co., 165 Greenwich, New York, N. Y.
Globe Mfg. Co., 101 Spokane St., Seattle, Wash.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
New England Products Co., 232 Greenwich, New York.
Preis & Co., Inc., H. P., 227 Fulton, New York, N. Y.
Schwenke Machine Engraving Co., 2036 Woodward Ave., Detroit, Mich.
Verichrome Laboratories, 4614 Spring Grove Ave., Cincinnati,
Wright Radio Co., 114 Exchange, Rockland, Mass.

EYELETS

Platt Bros. & Co., Waterbury, Conn.
Waterbury Brass Goods Co., Waterbury, Conn.
Waterbury Button Co., 835 S. Main, Waterbury, Conn.

FABRIC, Radio Grill. See Cloth, Untreated.
FABRIC SHADES. See Shades, Fabric.
FAN BLADES. See Blades, Fan.

FEET, Felt

Brawley, T. R., 279 20th, Brooklyn, N. Y.

FELT

Advance Felt & Cutting Co., 317½ S. Jefferson, Chicago.
American Felt Co., 211 Congress, Boston, Mass.
Booth Felt Co., 460 18th, Brooklyn, N. Y.
Brawley, T. R., 279 20th, Brooklyn, N. Y.
Western Felt Wks., 4029 Ogden Ave., Chicago, Ill.

FERRULES

Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, 490 Hancock Ave., Bridgeport, Conn.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Massachusetts Machine Shop, Inc., Boston, Mass.
Patton-MacGuyer Co., Providence, R. I.
Platt Bros. & Co., Waterbury, Conn.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., 99 Mill, Waterbury, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.

FIBRE BOARD PRODUCTS (Solid and Corrugated)

Container Corp. of America, 111 W. Washington, Dept. 36, Chicago, Ill.
Mid-West Box Co., 111 W. Washington, Chicago.
Sefton Mfg. Corp., 59 E. Madison, Chicago, Ill.

FIBER CANDLES. See Candles, Fixture.
FIBRE GEARS. See Gears and Pinions, Composition.
Paper. See Cloth and Paper.
Radio Panels. See Radio Molded Parts.
Shipping Containers. See Fibre Board Products.
Vulcanized. See Fibre, Vulcanized.

FIBRE, Phenol

Moisture Proof; Sheet, Rod, Tubes.
Armite. See Spaulding Fibre Co.
Bakelite-Dilecto. See Continental Fibre Co.
Campbell Fibre Co., Heather Ave., Stanton, Del.
Campbellite. See Campbell Fibre Co.
Celoron Co., Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Fibroc Insulation Co., 245 Lincoln Ave., Valparaiso, Ind.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Franklin Fibre Specialty Co., Wilmington, Del.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Phenolite See National Vulcanized Fibre Co.
Spaulding Fibre Co., Inc., Tonawanda, N. Y.
Synthane Corp., Oaks, Pa.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

FIBRE, Vulcanized

Sheet, Rod, Tube, Horn, Fibre, Bushings, Washers, Cleats, Screw Machine Products.
Brandywine Fibre Products Co., 1402 Walnut St., Wilmington, Del.
Conite. See Continental-Diamond Fibre Co.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Del
Diamond F. See Continental-Diamond Fibre Co.
Egyptian. See Delaware Hard Fibre Co.
Electrosote. See Pantasote Co.
Fibro Products Co., New Bedford, Mass.
Franklin Fibre Specialty Co., Wilmington, Del.
Fyberoid. See Wilmington Fibre Specialty Co.
Independent Laboratories, 50 E. 42nd, New York, N. Y.
Ilan Fibre Co., 5403 Bower Ave., Cleveland, O.
Leatheroid. See Rogers Fibre Co.
Lincoln Fibre & Specialty Co., Newport, Del.
National Vulcanized Fibre Co., Wilmington, Del.
Ohmoid. See Wilmington Fibre Specialty Co.
Pantasote Co., Inc., 250 Park Ave., New York, N. Y.
Peerless. See National Vulcanized Fibre Co.
Rogers Fibre Co., 210 Lincoln, Boston, Mass.
Spaulding Fibre Co., Tonawanda, N. Y.
Standard Fibre Products Co., 36 Pleasant, Watertown, Mass.
Vul-Cot. See National Vulcanized Fibre Co.
Vulcawood. See Continental-Diamond Fibre Co.
Wilmington Fibre Specialty Co., Wilmington, Del.

FIBRE WASHERS. See Fibre.
FIELD COILS. See Coils, Finished.

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CLEVELAND 1302-4-6 ONTARIO ST.
CHICAGO 320 WRIGLEY BLDG.

FILAMENTS, Incandescent Lamp

Conneway Elec. Laboratories, 406 Jefferson St., Hoboken.
Filament Supply Co., 1317 Willow Ave., Hoboken, N. J.
Suter & Nuetzi, 3709½ Lisbon Ave., Milwaukee, Wis.
Vacuum Tube Products, Steneck Trust Bldg., Hoboken, N. J.
Volkmar & Sons, 187 Sylvan Ave., Newark, N. J. (Lead-in-Welds.)

FILES, Commutator Slotting

Ideal Commutator Dresser Co., 1008 Park, Sycamore, Ill.
Martindale Electric Co., 1255 W. Fourth, Cleveland, O.

FISH PAPER. See Cloth and Paper.
FITTINGS, Fixture. See Fixture Fittings.
FIXTURE CANDLES. See Candles, Fixture.
FIXTURE CHAIN. See Chain, Fixture.
FIXTURE, Collars. See Fixture Fittings.

FIXTURE FITTINGS

	KEY
Bowl Holders	See B
Brass Fittings	See B
Canopies	See B
Collars	See B
Crow Feet	See I
Finials (Brass, Glass and Porcelain)	See B
Hangers	See H
Hickies, Brass	See B
Hickies, Iron	See I
Hooks, Brass	See B
Hooks, Iron	See I
Iron Fittings	See I
Loops, Brass	See B
Loops, Iron	See I
Rings	See B
Shade Holders	See S
Shells	See B
Spinnings	See B
Stampings	See B
Stems	See B
Straps	See H
Studs	See I

Acme Lighting Products, Inc., 2114 Woodland Ave., Cleveland, O. Straps					H
American Chain Co., Bridgeport, Conn. (Loops and Rings.)	B				
American Ring Co., Waterbury, Conn. (Candle.)				S	
Appleton Electric Co., 1703 Wellington Ave., Chicago, Ill.	B	I			
Arco. See American Ring Co.					
Arrow Electric Division of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.				S	
Artoloid. See Great Eastern Brass Wks., Inc.					
Art Metal Co., 3721 Dayton, Cleveland, O.					H
Banlite. See East Side Metal Spinning Co.					
Banner. See Plume & Atwood Mfg. Co.					
Barton Brass Wks., 3627 Superior, Detroit.	B				
Belmet. See B. & L. Metal Stamping Co.					
Bloch Bros., 88 Walker, New York	B				
Brandt Mfg. Co., 3727 Gratiot Ave., Detroit.	B				
Braun, J. G., 609 S. Pauline, Chicago, Ill. (Pressed Ornaments.)	B	I			
B. & L. Metal Stamping Co., 250 Moore, Brooklyn, N. Y. (Also Combination Wall Bracket Hanger.)	B	I			H
Cambridge Brass Co., Cambridge, Mass.	B				
Chase Brass & Copper Co., Waterbury, Conn.	B			S	
Cleanexy. See Dunlap Co.					
Colonial Stamping Co., Brill St. & Passaic Ave., Newark, N. J.	B			S	
Crescent Brass Mfg. Co., Reading, Pa.	B				
Crouse-Hinds, Solvay Sta., Syracuse, N. Y.				S	H
Diamond Needle & Mfg. Co., Torrington, Conn. (Hickies.)		I			
Dunlap Co., John, Carnegie, Pa.				S	
East Side Metal Spinning Co., 451 Greenwich, New York, N. Y.	B				
Eureka Tin Ware Mfg. Co., 135 W. 20th, New York, N. Y.				S	
E-Z Up. See Plume & Atwood Mfg. Co.					
Faries Mfg. Co., Decatur, Ill.	B	I		S	H
Flaherty Co., M. E., 23 S. Clinton, Chicago.		I			
Fralick Co., S. R., 15 S. Clinton, Chicago.		I			
Franklin Brass Foundry Co., Reading, Pa.	B				
Friedley-Voshardt Co. Chicago.	B				
Grabler Mfg. Co., 6565 Broadway, S. E., Cleveland, O.		I			
Great Eastern Brass Wks., Inc., 182 Grand, New York, N. Y. (Spindles).					
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.				S	
Incandescent Supply Co., 468 West Broadway, New York, N. Y.	B				H
Isco. See Incandescent Supply Co.					
Jiffy. See White Mfg. Co., J. H.					
Kwikon. See Fralick Co., S. R.					
Lakin. See Thomas & Betts Co.					
Liberty Brass Turning Co., 88 Walker, New York, N. Y.		I			
Liberty Iron Pipe & Nipple Works, 62 Greene, New York, N. Y.	B	I			
Liberty Machine Co., Wauwatosa, Wis.	B	I			
Light Metal Stamping Co., 310 13th St., West New York, N. J.				S	
L & K Mfg. Co. 440 Adelphi, Brooklyn, N. Y.					H
L. & W. Brass Wks., 381 W. Superior, Chicago, Ill.	B				
Madelite. See Belson Mfg. Co.					
M. S. W. Mfg. Co., 1527 Niagara Ave., Buffalo, N. Y.		I			
Metal Products Co., 210 Canal, New York.	B				
Metro Iron Ornament Co., 191 Christie, New York, N. Y.		I			
Metropolitan-Columbia Mfg. Co., 714 Metropolitan Ave., Brooklyn, N. Y.	B				
Midwest Elec. Co., 1639 Walnut, Chicago, Ill.		I			

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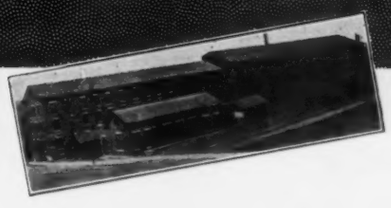


Auburn Plant, Auburn, New York

FIXTURE FITTINGS—Continued
Mid-West Chandelier Co., 14th & Chestnut Sts., Kansas City, Mo. B
Michell-Vance Co., 70 Washington, Brooklyn, N. Y. S
Monarch. See Perfeclite Co.
Murlin Mfg. Co., Philadelphia, Pa. B I
National Electric Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. (Studs.) I
New Era Elec. Mfg. Co., 6725 Machinery Ave., N. E., Cleveland, O. H
New Wrinkle. See Bryant Elec. Co.
New York Brass Turning Co., 568 Broadway, New York, N. Y. B
Nobolt. See Fralick & Co., S. B.
N. W. Cleat Receptacle Bracket, 2437 N. 29th, Philadelphia, Pa. I
Onli. See Perfeclite Co.
Pass & Seymour, Solvay Sts., Syracuse, N. Y. B S
Perfeclite Co., 1457 E. 40th, Cleveland S
Pittsburgh Valve & Fittings Co., Barberton, O. I
Plume & Atwood Mfg. Co., Waterbury, Conn. B S H
Plumwood. See Plume & Atwood Mfg. Co.
Plymouth. See Vester Sons, Alfred.
Reading Brass Co., 141 Schiller, Reading, Pa. B I
Ribaysen Mfg. Co., J., 952 W. Lake, Chicago, Ill. B
Rodale Mfg. Co., 200 Hudson, New York B H
Sandow Tool Co., 1440 Bway, New York, N. Y. S
Scovill Mfg. Co., Waterbury, Conn. B I
Simpalite. See Sprecher Mfg. Co., P. W.
Simplex. See Plume & Atwood Mfg. Co.
Springfast. See Plume & Atwood Mfg. Co.
Square-G. See Grabier Mfg. Co.
Standard Snap-Lite Corp., 504 Jackson Ave., Long Island City, N. Y. S
Standard Metal Spinning Co., 128 Mott, New York, N. Y. B
Star. See Perfeclite Co.
Star. See Steel City Elec. Co.
Steel City Elec. Co., Pittsburgh, Pa. I
Steele & Johnson Mfg. Co., Waterbury, Conn. B S
Stembridge, Tenny & Brandt, 29 S. Clinton, Chicago, Ill. (White Metal.) B
Sterling Spinning & Stamping Wks., 476 Broome, New York, N. Y.
T. & B. See Thomas & Betts Co.
Thomas & Betts Co., 63 Vesey, New York I
Uno. See Bryant Elec. Co., also Crouse-Hinds, also General Elec. Co., also Hart & Hegeman Mfg. Co., also Pass & Seymour.
United. See L & K Mfg. Co.
United Metal Spinning Co., 440 Adelphi, Brooklyn, N. Y. B
Vester, Sons, Alfred, 5 Mason, Providence, R. I. B
Victor. See Plume & Atwood Mfg. Co.
Virden, Div. of Gill-Virden Co., 6103 Longfellow Ave., Cleveland, O. B
Walden Tool & Metal Mfg. Co., New Haven Conn.
Wameco. See Waterbury Metal Wares Co.
Waterbury Co., Waterbury, Conn. B
Waterbury Metal Wares Co., Waterbury, Conn. S
Weber Brass Co., Whitney Power Block, Cleveland, O. B
White Diamond. See White Mfg. Co., J. H.
White Mfg. Co., J. H., 111 N. 3rd, Brooklyn, N. Y. B S
Wilhite Machine Wks., 1245 S. Hope, Los Angeles, Cal. B

FLASHERS, Sign

Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.
Ajax. See Reynolds Spring Co.
A. & W. See General Outdoor Adv. Co.
Angelus. See Electric Sign Flasher Corp.
Betts, Inc., James H., 1393 Sedgwick Ave., New York. (Motor Flashers, Thermal Flashers, Flashing Sockets and Plugs.)
Betts & Betts Corp., 645 W. 43rd, New York, N. Y. (Motor Flashers.) (Thermal Flashers.) Flashing Plugs.)
California Sign Flasher Co., 280 Guttenberg, San Francisco, Cal.
Commercial Elec. Co., 1203 E. Grant, Portland, Ore.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Diamond. See General Appliance Corp.
Dominic. See Kala-Flasher Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electric Signal Corp., 406 Fourth Ave., Seattle, Wash.
Electric Sign Flasher Corp., 1826 W. 9th, Los Angeles, Cal.
Figuregram. See Reynolds Electric Co.
Flash O-Lite. See Betts, Inc., James H.
Flip-Flop. See Betts, Inc., James H.
Gem Engineering Co., Hempstead, N. Y.
Gacor. See General Appliance Corp.
General Appliance Corp., 120 8th, San Francisco, Cal. (Flasher Button.)
General Controler Co., 200 E. First, Dayton, O.
Grazier Elec'l Products Co., Johnstown, Pa.
Horni Signal Mfg. Co., 516 Greenwich, New York, N. Y.
Jimbetts. See Betts, Inc., James H.
Kala-Flasher Co., 344 N. Church, Kalamazoo, Mich.
Killark. See Betts & Betts Corp.
Kontroler. See General Controler Co.
Mercury. See Betts, Inc., James H.
Opalume Sign System, Battle Creek, Mich.
Phelps Elec. Co., 29 S. Clinton, Chicago, Ill. (Motorless)
Phoenix Products Co., Phoenix, N. Y.
Presto Products Co., 64 University Place, New York, N. Y. (Sockets and Plugs.)
Reco. See Reynolds Elec. Co.
Reynolds Elec. Co., 2650 W. Congress, Chicago, Ill.
Reynolds Spring Co., Jackson, Mich.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Ryan. See Phoenix Products Co.
Skedoodle. See Phelps Elec. Co.
Sokit. See Betts, Inc., James H.
Thermo-Wynk. See Betts & Betts Corp.
Vacu. See Betts & Betts Corp.
Veebar. See Betts, Inc., James H.
Way, Eugene W., Seattle, Wash.
Wood Electric Co., C. D., 565 Broadway, New York N. Y
Woodwin. See Wood Elec. Co., C. D.
Wynk-A-Lyte. See Betts & Betts Corp.

FLASHLIGHT LENSES. See Lenses.
FLEXIBLE ARMS. See Tubing, Flexible Metallic.
FLEXIBLE LEADS, Commutator Brush. See Brushes, Commutator.

FLEXIBLE SHAFT MACHINES

(For shafting. See Tubing, Flexible Metallic.)
Strand & Co., N. A., 5001 N. Lincoln, Chicago, Ill.

FORGINGS, Non-Ferrous

Scovill Mfg. Co., Waterbury, Conn.

FORMS, Coil Winding

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, O.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Master. See Armature Coil Equipment Co.

FORMS, Wire

Forms and Frames for Shade Holders and Shades: Bending, Welding, Forming.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Arrow Wire Frame Corp., 344 E. 23rd, New York, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Central Wire Frame Co., 154 E. 23rd, New York, N. Y. (Complete with socket, cord and plug.)
Chelsea Wire Wks., 675 Hudson, New York, N. Y.
Clark Metal Products Inc., 490 Hancock Ave., Bridgeport Conn.
Electro Weld Co., 70 Munroe, Lynn, Mass.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Lansdale, Pa.
Jeschke Wire Specialty Wks., Crawfordsville, Ind.
Kriscker's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Manhattan Wire Products Co., 398 First Ave., New York.
Murray Hill Wire Frame Co., 314 E. 82nd, New York, N. Y.
Roebling's Sons Co., John A., Trenton, N. J.
Steinen & Co., 297 Washington, Newark, N. J.
Watral & Sons, 133 E. 16th, New York, N. Y.
Young Industries, Inc., L. A., Detroit, Mich.

FRAMES, Wire. See Forms, Wire.
FRICTION TAPE. See Tape, Rubber and Friction.
FRINGE, Chandelier. See Crystals, Chandelier.

FUSE CLIPS

Sherman Mfg. Co., H. B., Battle Creek, Mich.
Waterbury Brass Goods Co., Waterbury, Conn.

FUSE TESTERS. See Testers, Fuse and Circuit.

FUSES AND FUSE WIRE

KEY
Cartridge ..... See C
Plug ..... See P
Non-Refillable ..... See N
Refillable ..... See R
Open Link ..... See O
Fuse Wire ..... See O

Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. P
Arkless. See Economy Fuse Mfg. Co.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. P N
Automatic Elec. Iron & Fuse Co., 215 S. American, Philadelphia, Pa. P
Blue Ribbon. See Royal Elec. Co.
Buss. See Bussman Mfg. Co.
Bussmann Mfg. Co., University & Jefferson Ave., St. Louis C P N R O
Chase-Shawmut Co., Newburyport, Mass. C P N R O
Clearsite. See Economy Fuse & Mfg. Co.
Clear-Top. See Trico Fuse Mfg. Co.
Colortop. See Trico Fuse Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn., (Automobile) C N R
Cote Bros. Mfg. Co., 182 W. Lake, Chicago C P R
Crystal. See Royal Elec. Co.
Daum Fuse & Elec. Mfg. Co., 1157 Hodgkiss, Pittsburgh C R
D. & W. See Graybar Electric Co.
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. C P N R
Eco. See Economy Fuse & Mfg. Co.
Electric Fuseguard Co., Charlottesville, Va. C P N R
Elliott Electric Co., Shreveport, La.
Gem. See Chicago-Jefferson Fuse & Electric
General Elec. Co., Section W-234 Merchandise Dept., Bridgeport, Conn. C P N R
Graybar Electric Co., Graybar Bldg., Lexington Ave. and 43rd St., New York, N. Y. C
Great Western Fuse Co., 415 Lexington Ave., New York, N. Y. C R
H. & H. See Hart & Hegeman.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. P R O
Hudson Wire Co., Ossining, N. Y. O
Kantark. See Trico Fuse Mfg. Co.
Kirkman Engrg. Co., 1 Dominick St., New York, N. Y. C P N O
Littelfuse Laboratories, 1772 Wilson Ave., Chicago, Ill. (Low Capacity, Glass Enclosed, .025 to 2 Amp.)
Monarch Fuse Co., Jamestown, N. Y. C N R
National. See Economy Fuse & Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Pierce Renewable Fuses, Inc., 752 Main, Buffalo, N. Y. C P R
Platt Bros. & Co., Waterbury, Conn. O
Powell, F. W., 119 W. Ohio, Pittsburgh P R
Ree-Nu-It Elec. Co., New Bedford, Mass. C P R
Rochester Re-Fill Fuse Co., 402 Cottage, Rochester, N. Y. C R
Royal Elec. Co., Chelsea Station, Boston P N
Shawmut. See Chase-Shawmut Co.
Simplicity. See Cote Bros. Mfg. Co.
Six-in-One. See Industrial Engrg. Co.
Star Fuse Co., 235 Canal, New York, N. Y. C P R
Trico Fuse Mfg. Co., 1001 McKinley Ave., Milwaukee C P N R
Union. See Chicago-Jefferson Fuse & Electric

GALVANIZING

Cattle & Bros., Joseph P., Gaul and Letterly Sts., Philadelphia, Pa.

GALVANOMETERS. See Instruments, Laboratory Standard.

GAS, Inert

Helium Co., Louisville, Ky.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.

GASKETS, Rubber

Gutta Percha & Rubber Mfg. Co., 15 Park Row, New York,
Canfield Rubber Co., Bridgeport, Conn.

GAUZE BRUSHES, Wire. See Brushes, Commutator.
GEARS, Fibre. See Gears and Pinions, Composition.

GEARS (Speed Changing Units)

Cleveland Worm & Gear Co., Cleveland, Ohio.
Cullman Wheel Co., 1346 Altgild, Chicago, Ill.
De Laval Steam Turbine Co., Trenton, N. J.
Falk Corp., Milwaukee, Wis.
Farrell-Birmingham Co., 344 Vielcan, Buffalo, N. Y.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago, Ill.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Jones Fdy. & Machine Co., W. A., Chicago, Ill.
Lipe, W. C., Syracuse, N. Y.
Nuttall Wks., of Westinghouse Elec. & Mfg. Co., McCandless Ave. & Harrison St., Pittsburgh, Pa.
Palmer-Bee Co., Detroit, Mich.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.
Smith Winfield H., Springville, N. Y.

GEARS, Worm

Albaugh-Dover Mfg. Co., Chicago, Ill.
Cleveland Worm & Gear Co., Cleveland, Ohio.
Colburn Gear & Mfg. Co. (Norfolk Downs), Quincy, Mass.
Philadelphia Gear Works, Richmond and Tioga Sts., Philadelphia, Pa.

GEARS AND PINIONS, Composition

Celoron Co., Bridgeport, Pa.
Continental-Diamond Fibre Co., Bridgeport, Pa.
Delaware Hard Fibre Co., Wilmington, Delaware.
Fabroil. See General Elec. Co.
Foote Bros. Gear & Machine Co., 215 N. Curtis, Chicago,
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Medart Co., St. Louis, Mo.
Micarta. See Westinghouse Elec. & Mfg. Co.
National Vulcanized Fibre Co., Wilmington, Del.
Perkins Machine & Gear Co., 125 Circuit Ave., Springfield, Mass.
Stahl Gear Co., 1390 E. 40th, Cleveland, Ohio.
Stranahan Gear Co., Philadelphia, Pa.
Textoil. See General Electric Co.
Textolite. See General Electric Co.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.

GEARS AND PINIONS, Iron and Steel

Earle Gear & Machine Co., Wayne Junction, Philadelphia.
Falk Corp., Milwaukee, Wis.
Gears & Forgings, Inc., Cleveland, Ohio.
Grant Gear Works, Boston, Mass.
James Mfg. Co., D. O., Chicago, Ill.
Medart Co., St. Louis, Mo.
Meisel Bros. Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Perkins Machine & Gear Co., 120 Circuit Ave., Springfield, Mass.
Permag. See Perkins Machine.
Tool Steel Gear & Pinion Co., Cincinnati, Ohio.

GEARS AND PINIONS, Rawhide

Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Gerdes & Co., 50 Church, New York, N. Y.
Syracuse Rawhide Mfg. Co., Syracuse, N. Y.
Western Rawhide & Belting Co., Milwaukee, Wis.

GENERATORS, Electroplating. See Plating Generators.
GLASS BULBS. See Bulbs, Glass.
GLASS CANDLES. See Candles, Fixture.
GLASS LETTERS. See Letters, Sign.

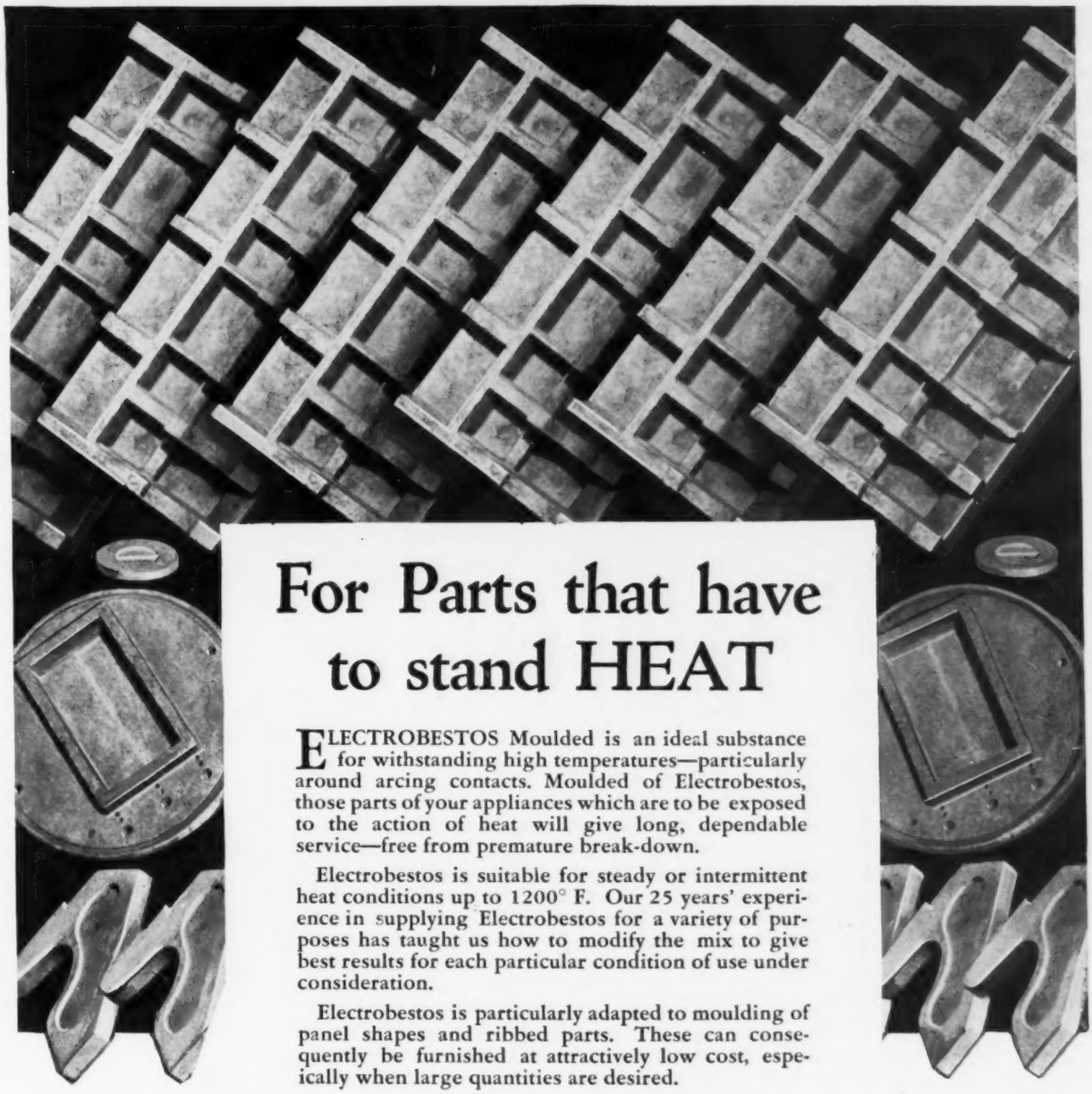
GLASS for Electrical Purposes

Corning Glass Wks., Corning, N. Y.
Pyrex. See Corning Glass Wks.

GLASSWARE

Alba. See Macbeth-Evans Glass Co.
Amazon. See Gleason-Tiebout Glass Co.
Ameilites. See Consolidated Lamp & Glass Co.
Apollo. See Gillinder Bros., Inc.
Ardmore. See Jeannette Shade & Novelty Co.
Aurene. See Corning Glass Co.
Aurora. See Consolidated Lamp & Glass Co.
Bayley Sons, 105 Vanderveer, Brooklyn, N. Y.
Beaumont Co., Morgantown, W. Va.
Bellova. See McFaddin & Co., H. G.
Blanco. See Gleason-Tiebout Glass Co.
Beryllite. See Plaut & Co., L.
Bostock, Rhodes & Co., 11 N. Moore, New York, N. Y.
Carnia. See Gleason-Tiebout Glass Co.
Carara. See Gleason-Tiebout Glass Co.
Celestialite. See Gleason-Tiebout Glass Co.
Chesler & Sons Co., J., 45 Varick Ave., Brooklyn, N. Y.
Clearcut. See Ivanhoe Division of Miller Co.
Colcite. See Corning Glass Co.
Consolidated Lamp & Glass Co., Coraopolis, Pa.
Cora. See Consolidated Lamp & Glass Co.
Cora-Lites. See Consolidated Lamp & Glass Co.
Corning Glass Co., Corning, N. Y.
Cremax. See Macbeth-Evans Glass Co.
Crystal. See Phoenix Glass Co.
Daylite. See Wells Glass Co.
Delica-White. See Kopp Glass, Inc.
Druid. See Ivanhoe Division of Miller Co.
Eagle Mfg. Co., Wellsburg, W. Va.
Emeralite. See McFaddin, H. G.
Equalite. See Bayley & Sons.
Erskine Glass & Mfg. Co., Wellsburg, W. Va.
Federal Light & Lens Corp., Star City, W. Va.
Florentine. See Gleason-Tiebout Glass Co.
Genco. See Ivanhoe Division of Miller Co.
Gillinder Bros., Inc., Port Jervis, N. Y.
Gillinder & Sons, Inc., Philadelphia, Pa.
Gleason-Tiebout Glass Co., 99 Commercial, Brooklyn, N. Y.
Gletteco. See Gleason-Tiebout Glass Co.
Havana. See Kopp Glass, Inc.
Hocking Glass Co., Lancaster, O.
Holophane Co., 342 Madison Ave., New York, N. Y.
Imperial Glass Co., Bellaire, O.
Inland Glass Works, Chicago, Ill.
Ivanhoe Division of Miller Co., Cleveland, Ohio.
Ivory. See Phoenix Glass Co.
Ivrex. See Ivanhoe Division of Miller Co.
Jeannette Shade & Novelty Co., Jeannette, Pa.
Jefferson Glass Co., Follansbee, W. Va.
Kauffeld Glass & Ceramic Co., Star City, W. Va.
Kopp Glass, Inc., Swissvale, Pa.
Lumina. See Hocking Glass Co.
Luminite. See Macbeth-Evans Glass Co.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa.
Magnolia. See Phoenix Glass Co.
McFaddin & Co., H. G., 38 Warren, New York, N. Y.
Melilite. See Gillinder & Sons, Inc.
Micro. See Gillinder & Sons, Inc.
Miller Co., Meriden, Conn.
Monax. See Macbeth-Evans Glass Co.
Moonstone. See Jefferson Glass Co.
N. B. G. See Gillinder & Sons, Inc.
N. U. Glass. See Gillinder & Sons, Inc.
Nebulite. See Gillinder & Sons, Inc.
Nemalite. See Gillinder & Sons, Inc.
Nitro-Glas. See Jefferson Glass Co.
Nuart. See Imperial Glass Co.
Nulite. See Consolidated Lamp & Glass Co.
Nutralux. See Kopp Glass, Inc.
Opalux. See Gleason-Tiebout Glass Co.
Opola. See Inland Glass Co.
Pastelle. See Consolidated Lamp & Glass Co.
Pearitone. See Inland Glass Co.
Persian. See Gillinder & Sons, Inc.
Phoenix Glass Co., 230 Fifth Ave., New York, N. Y.
Pilabrasgo. See Kopp Glass, Inc.
Pittsburgh Cut Glass Co., Monaca, Pa.
Plaut & Co., L., 432 E. 23rd, New York, N. Y.
Poly-Case. See Gleason-Tiebout Glass Co.
Prestopal. See Gleason-Tiebout Glass Co.
Quezal Glass Mfg. Co., Fresh Pond Rd. and Metropolitan Ave., Brooklyn, N. Y.
Radiant. See Phoenix Glass Co.
Regent. See Ivanhoe Division of Miller Co.
Rezelle. See Ivanhoe Division of Miller Co.
Rosedora. See Consolidated Lamp & Glass Co.
Shade-O-Tone. See Consolidated Lamp & Glass Co.
Snow-White. See Inland Glass Works.
Soloman & Son, Inc., L., 199 Wooster, New York, N. Y.
Star Glass Co., Star City, W. Va.
Sudan. See Ivanhoe Division of Miller Co.

ELECTROBESTOS



For Parts that have to stand HEAT

ELECTROBESTOS Moulded is an ideal substance for withstanding high temperatures—particularly around arcing contacts. Moulded of Electrobestos, those parts of your appliances which are to be exposed to the action of heat will give long, dependable service—free from premature break-down.

Electrobestos is suitable for steady or intermittent heat conditions up to 1200° F. Our 25 years' experience in supplying Electrobestos for a variety of purposes has taught us how to modify the mix to give best results for each particular condition of use under consideration.

Electrobestos is particularly adapted to moulding of panel shapes and ribbed parts. These can consequently be furnished at attractively low cost, espeically when large quantities are desired.

Are you using parts like these?

Electrobestos has been widely and successfully used for:—Heat-resisting cores, arc deflectors, apparatus bases, cable protectors, Lehr rolls, grid buttons, bushings, small rectangular or cylindrical boxes, tees and elbows, arc chutes, rods and tubes, soldering blocks and cups, large bushings for electric furnaces, heat shields, boiler plugs, resistance cores.

If you are using parts like these, we believe it will pay you to have a Johns-Manville representative call and show you what they would cost moulded from Electrobestos.

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JOHNS-MANVILLE CORPORATION
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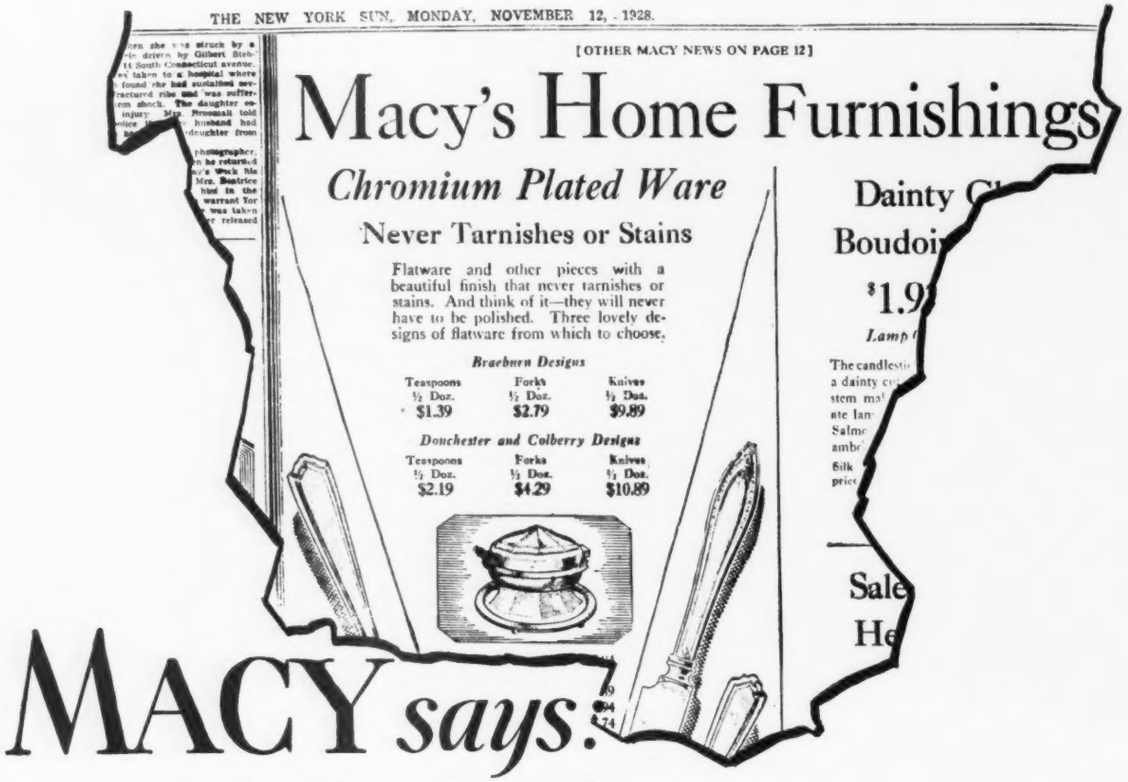
THE NEW YORK SUN, MONDAY, NOVEMBER 12, 1928.
[OTHER MACY NEWS ON PAGE 12]
Macy's Home Furnishings
Chromium Plated Ware
Never Tarnishes or Stains
Flatware and other pieces with a beautiful finish that never tarnishes or stains. And think of it—they will never have to be polished. Three lovely designs of flatware from which to choose.
Braeburn Design
Teaspoons ½ Doz. $1.39
Forks ½ Doz. $2.79
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Teaspoons ½ Doz. $2.19
Forks ½ Doz. $4.29
Knives ½ Doz. $10.89
Dainty
Boudoi
$1.9
Lamp
Sale
He
MACY says:
"..think of it..they never have to be polished"....

NATIONAL and local advertising of Chromium Plated ware is getting to be a regular thing.

The better class of manufacturers and merchants were quick to recognize the trend of demand—and, presto!... the brilliant U. C. Chromium Plate made its appearance in the finest shopping circles.

The public is Chromium conscious. Chromium Plate is not only being asked for—it is being demanded! Its permanently brilliant and non-tarnishable finish appeals to customers and storekeeper alike.

United Chromium, Inc., is organized to render a valuable service to electrical manufacturers. Our licensing plan and service includes the supervision of new plant installations; coaching of platers and periodic tests.

Names of our licensees will gladly be sent to manufacturers whose present needs do not justify their own plating department, but who, nevertheless, contemplate the use of Chromium Plate on their products.

UNITED CHROMIUM

INCORPORATED

Executive Office: 51 East 42nd Street, New York City

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322 Bellevue Ave.

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114 Sansome Street.

Waterbury, Conn.

Nenzelite Lamp and Switch of Bakelite Molded. Made by Nenzel Mfg. Co., Los Angeles, Calif.

An ingenious head lamp made practical through a *Bakelite Molded* housing

METAL housed lamps become hot quickly and are uncomfortable when worn on the forehead for localized lighting. In the Nenzel head lamp this difficulty is overcome through the use of a Bakelite Molded housing which provides both thermal and electrical insulation.

These Bakelite Molded housings are strong, light in weight and of neat design. Fittings for the head strap and the hook are firmly embedded at the time of molding, and clean deep threading for the lens ring is also formed without an extra operation. The lasting lustrous finish, acquired in the mold, eliminates any need for plating or polishing.

The cord-connector switch is also formed of Bakelite Molded and requires no additional insulation. Light in weight and durably strong, each switch part comes from the mold finished and ready for easy assembly.

Bakelite Molded combines high mechanical strength with the insulation value required for electrical devices, appliances and parts.

Bakelite Engineering Service

Intimate knowledge of thousands of varied applications of Bakelite Materials combined with eighteen years' experience in the development of phenol resinoids for electrical uses provides a valuable background for the cooperation offered by our engineers and research laboratories. Write for booklet 52M, "Bakelite Molded."

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247 Park Avenue, New York, N. Y. Chicago Office, 635 West 22nd Street

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"The registered Trade Mark and Symbol shown above may be used only on products made from materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products."

GLASSWARE—Continued
Thebian. See Macbeth-Evans Glass Co.
Transiux. See Kopp Glass, Inc.
Trojan. See Ivanhoe Div. of Miller Co.
United Novelty Glass Mfg. Co., 121 Prince, New York, N. Y.
Utopia. See Kopp Glass, Inc.
Veiaria. See Ivanhoe Division of Miller Co.
Vineland Flint Glass Wks., Vineland, N. J.
Wells Glass Co., Kokomo, Ind.
Williamsburg Flint Glass Co., 290 Broadway, New York.
Yural. See Ivanhoe Division of Miller Co.
Zanesville Mould Co., Zanesville, O.

GONGS, Unmounted Shells
Bevin Bros. Mfg. Co., East Hampton, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
East Hampton Bell Co., East Hampton, Conn.
Gong Bell Mfg. Co., East Hampton, Conn.
Hill Brass Co., M. N., East Hampton, Conn.
Liberty Bell Mfg. Co., Minerva, O.
Reiter, G. C., Canton, O.

GRAPHITE BEARINGS. See Bearings, Oil-less.
GRID LEAKS. See Radio Circuit Components.
GRIDS, Resistance. See Units, Rods and Grids.
GRILL CLOTH. See Cloth, Untreated.
GROMMETS. See Eyelets.
GROUND LOCATORS. See Instruments, Portable and Switchboard: also Testers, Coil.
GROWLERS, Armature. See Testers, Coil.

HANDLES, Wood; For Switches or Sad Irons
Allen, Chas. E., Pequabuck, Conn.
American Enamel Co., 20 Neville, Providence, R. I.
Bogert & Hopper, 225 Varick, New York, N. Y.
Estes & Son, E. B., 5844 Grand Central Terminal Bldg., New York, N. Y.
Fitchburg Enamel Co., Fitchburg, Mass.
Flanders Hardware Co., North Weare, N. H.
Fuller, J. J. Westfield, Mass.
Narragansett Mach. Co., Pawtucket, R. I.
National Wood Process, New Bedford, Mass.
Novelty Turning Co., Norway, Me.
Ober Mfg. Co., Chagrin Falls, O.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland, O.
Piqua Handle & Mfg. Co., Piqua, Ohio.
Royal Enamel Co., Fitchburg, Mass.
Schutz Bros., 152 Chambers, New York, N. Y.
Stiles & Co., H. A., 174 Portland, Boston, Mass.
Stratton Mfg. Co., Stratton, Maine.
Sun Enamel Wks., Leominster, Mass.

HOLDERS, Brush. See Brushes, Commutator.
HOT WIRE METERS. See Instruments, Portable and Switchboard.
IMPREGNATING COMPOUNDS. See Wax and Compounds
IMPREGNATING, VACUUM. See Ovens, Industrial.
INCANDESCENT LAMP BULBS (Unfinished). See Bulbs, Glass.
INCANDESCENT LAMP FILAMENTS. See Filaments, Incandescent Lamp.

INDICATORS, Operation
Operation and Cost Indicators for Manager's Office.
Bristol Co., Waterbury, Conn. (Elapsed Time Recorder.)
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Production Meter Co., 1315 S. Wabash Ave., Chicago, Ill.
INDUCTION COILS. See Coils, Finished.
INSTRUMENT, Jewels. See Jewels.
INSTRUMENTS, Laboratory Standard. See Instruments, Laboratory Standard.
INSTRUMENTS, Portable Testing. See Instruments, Portable and Switchboard: also Instruments, Pocket.

INSTRUMENTS, Laboratory Standard
Beck Bros., 3640 N. Second, Philadelphia, Pa.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Burt, R. C., 327 Michigan Ave., Pasadena, Cal. (Oscilloscopes.)
Cambridge Instrument Co., Ossining, N. Y.
Chicago Apparatus Co., 1735 N. Ashland Ave., Chicago, Ill
Eppley Laboratory, Newport, R. I. (Standard Cells.)
Fahy. See Rubicon Co.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Hickok Elec'l Instrument Co., 10514 Dupont, Cleveland, O
Jagabi. See Biddle, James G.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kasson. See Rawson Elec'l. Instrument Co.
Kelvin. See Leeds & Northrup Co.
Kohlrausch. See Leeds & Northrup Co.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa
Milvay. See Chicago Apparatus Co.
Osiso. See Westinghouse Electric & Mfg. Co.
Radio Elec'l Wks., 50 W. 22nd, New York, N. Y.
Rawson Elec'l Instrument Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Rubicon Co., 29 N. Sixth, Philadelphia Pa. (Wheatstone Bridges, Galvanometers, Inductance Condensers, Potentiometers, Resistance Boxes, Permeameters.)
Simplex. See Leeds & Northrup Co.
Strobatchy. See Radio Elec'l Wks.
Thompson-Levering Co., 351 N. 57th St., Philadelphia, Pa
Vawter. See Thompson-Levering Co.
Unipivot. See Rawson Elec'l Inst. Co.
Vreeland Apparatus Co., 140 Cedar, New York, N. Y (Sine Wave Oscillators.)
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSTRUMENTS, Pocket
Advance. See Eldredge Elec'l Corp.
Adbro Mfg. Co., 927 French, Pittsburgh, Pa.
Eclipse. See Eldredge Elec'l Corp.
Eldredge Elec'l Corp., 3 P. O. Sq., Springfield, Mass.
Ideal Instrument Co., Penacook, N. H.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Lundquist Tool & Mfg. Co., Worcester, Mass.
Milavolt. See Adbro Mfg. Co.
Readrite Meter Works, 7 College Ave., Bluffton, Ohio.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Shire Elec. Products Co., Marquette Bldg., Detroit, Mich
Sholder-Excel Mfg. Co., Clyde, Ohio.
Square D Company, Detroit, Mich.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.
Wigginton. See Square D Company.
Yankee. See Lundquist Tool Mfg. Co.

INSTRUMENTS, Portable and Switchboard
This heading includes all standard, portable and switchboard types, measuring and testing instruments—ammeters, voltmeters, wattmeters, ohmmeters, cable testers and fault-finders.
See Also Instruments, Pocket; Also Instruments, Laboratory Standard.
Beck Bros., 421 Sedgley Ave., Philadelphia, Pa.
Beede Instrument Co., Penacook, N. H.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne and Windrim Sts., Philadelphia, Pa.
Cambridge Instrument Co., Ossining, N. Y.
Dongan Electric Mfg. Co., 2585 Franklin, Detroit, Mich.

Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Electric Mfg. Co., 986 Mission, San Francisco, Cal.
Esterline-Angus Co., Speedway, Indianapolis, Ind.
Fidelity Electric Co., Lancaster, Pa.
Fisher Cable Test Sets. See Leeds & Northrup.
Fore Elecl. Mfg. Co., 5255 Wabada Ave., St. Louis, Mo.
Freyn Engrg. Co., 310 S. Michigan Ave., Chicago, Ill.
General Electric Co., Schenectady, N. Y.
Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa.
Ground-Ohmer. See Sticht & Co.
Handy. See Weinberg & Co.
Hickok Elecl. Inst. Co., 10514 Dupont, Cleveland, O.
Hoyt Elecl. Inst. Wks., 857 Boylston, Boston, Mass.
I T L. See Illinois Testing Laboratories.
Jewell Elec. Instrument Co., 1650 Walnut, Chicago, Ill
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Master. See Jewell Elecl. Instrument Co.
M. D. C. See Metropolitan Devices Corp.
Megger Testing Sets. See Biddle.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn
Multi-Volt Trouble Finder. See Weiford, Jr., Geo. W.
Nagel Elecl. Co., W. G., 28 St. Clair, Toledo, Ohio.
Norton Elecl. Inst. Co., 81 Hilliard, Manchester, Conn.
Paneltest Meters. See Beede Instrument Co.
Peerless Meters. See Thompson-Levering Co.
Pier Equipment Mfg. Co., Benton Harbor, Mich.
Pin-Jack. See Weston Elec'l Instrument Co.
Price Hollister Co., Rockford, Ill.
Radio Electric Works, 150 West 22nd St., New York, N. Y.
Rawson Elecl. Inst. Co., Cambridge, Mass.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Sangamo Elec. Co., Springfield, Ill.
Shortfinder. See Eisemann Shortfinder Co.
Standee. See Sticht & Co., H. H.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Tanner Engrg. Co., Rawson St. and Nelson Ave., Long Island City, N. Y.
Test-A-Bat. See Beede Instrument Co.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thomson. See General Electric Co.
Triplex Meters. See Roller-Smith Co.
3 in 1. See Sticht & Co., H. H.
Two-in-One. See Sticht Co., Herman H.
United States Gauge Co., 44 Beaver, New York, N. Y.
Utility. See Esterline-Angus Co.
Westinghouse Electric & Mfg. Co., Newark, N. J.
Weston Elecl. Instrument Corp., 582 Frelinghuysen Ave., Newark, N. J.

INSULATION (Insulating) (Insulators)
Beads. See Beads, Insulating.
Canopy. See Insulators, Canopy.
Cloth. See Cloth & Paper.
Composition. See Molded Insulation.
Compound. See Wax and Comp.
Fibre. See Fibre.
Lava. See Cores, Resistance Coil.
Marble. See Slate.
Mica. See Mica.
Molded. See Molded Insulation.
Paint. See Paint and Varnish.
Paper. See Cloth and Paper Insulating.
Phenolic. See Fibre, Phenol. Also Molded Insulation.
Porcelain. See Porcelain.
Rod. See Rubber, Hard.
Rubber. See Rubber, Hard.
Sealing Wax. See Wax and Compounds.
Slate. See Slate.
Soapstone. See Soapstone.
Tubing. See Tubing, Varnished Fabrics.
Varnish. See Paint and Varnish.
Wax. See Wax and Compounds.

INSULATING MACHINES, WIRE. See Wire Manufacturing Machines.
INSULATING TUBING. See Tubing, Varnished Fabric; also Tubing, Rubber.

INSULATION CUTTERS
Artos Engrg. Co., Milwaukee, Wis.

INSULATION MIXERS
Baker Perkins Co., Saginaw, Mich.
INSULATION SHEARS. See Shears, Insulation.
INSULATION STRAINING MACHINES. See Wire Manufacturing Machines.
INSULATION TESTERS. See Instruments, Laboratory Standard.

INSULATORS, Canopy
Continental-Diamond Fibre Co., Bridgeport, Pa.
Franklin Fibre Specialty Co., Wilmington, Del.
General Electric Co., Schenectady, N. Y.
Knu. See Stanley, Arthur F.
Macallen Co., Boston 27, Mass.
Stanley, Arthur F. 150 Varick, New York, N. Y.
Wilmington Fibre Specialty Co., Wilmington, Del.
IRON CASTINGS. See Castings, Gray Iron.
IRONS, Soldering. See Soldering Irons.
JACKS, Armature. See Lifts, Armature.
JACKS, Radio. See Radio Receiver Parts.

JARS, Battery, Glass
For Composition Jars. See Molded Insulation; also Rubber.
Corning Glass Co., Corning, N. Y.
Cumberland Glass Mfg. Co., Bridgeton, N. J.
Gaynor Glass Works, Salem, N. J.
Gillinder & Sons, Inc., Philadelphia, Pa.
Hazel-Atlas Glass Co., Wheeling, W. Va.
Macbeth-Evans Glass Co., Dept. G, Eastern Division, Charlerol, Pa.
Rodefer Glass Co., Bellaire, O.
Sonesta Glass Co., Hartford City, Ind.
United States Glass Co., 9th & Bingham, Pittsburgh, Pa.

JEWELS, Instrument Bearing
Bird, Richard H., Waltham, Mass.
Deknatel & Sons, J. A., Queens Village, N. Y.
Eastern Specialty Co., 3551 N. Fifth, Philadelphia, Pa.
Fisher, Thomas E., Penacook N. H.
Gatti, Inc., Aurele M., Liberty St. & Fairmount Ave., Trenton, N. J.
Moser Jewel Co., Perth Amboy, N. J.
Mildrum Jewel Co., East Berlin, Conn.
Sapphire Products Co., 51 Chambers, New York, N. Y.
Wennstrom's Sons Co., John, Suffern, N. Y.
Worley Jewel Co., John, Waltham, Mass.
Universal. See Oefinger, J. L.

JOINTS, Fixture Insulating
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill.
Macallen Co., Boston 27, Mass.
Sandow Tool Co., 1440 Broadway, New York, N. Y.
Sprecher Mfg. Co., P. W., 3220 North Ave., Milwaukee.
White Co., O. C., 15 Hermon, Worcester, Mass.
Wittenberg Bros., 60 Shipman, Newark, N. J.

LABORATORY (Laboratories.)
Ovens. See Ovens, Industrial & Laboratory.
Rheostats. See Rheostats.
Testing. See Testing.
LABORATORY STANDARD INSTRUMENTS. See Instruments, Laboratory Standard.

LACQUER, ARMATURE. See Paint, Varnish and Lacquer. Metal. See Paint, Varnish and Lacquer.
LAMINATIONS. See Discs, Armature.
LAMP BASES. See Bases, Reading Lamp.
LAMP BULBS (Unfinished). See Bulbs, Glass.
LAMP FILAMENTS. See Filaments, Incandescent Lamp.
LAMP LEAD-IN WELDS. See Filaments, Incandescent Lamp.
LAMP TESTING PHOTOMETERS. See Photometers, Lamp Testing.

LATHES
(Special for use in Motor Repairing and Motor Mfg.—Test Bench Lathes).
Ajax Electric Co., Kalamazoo, Michigan.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Cincinnati Lathe & Tool Co., 3307 Disney (Oakley) Cincinnati, Ohio.
Hobart Bros. Company, Troy, Ohio. (Test Bench).
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.
LAVA. See Cores, Resistance Coil.
LEAD-IN WELDS, Lamp. See Filaments, Incandescent Lamp.
LEADS, FLEXIBLE (Commutator Brush). See Brushes, Commutator.

LENSES
Sign Letter, Flashlight, Projector and Reflector Lenses. Also glass caps, jewels and bezels for all electrical devices
See also Jewels, Instrument Bearing.
Bausch & Lomb Optical Co., 635 St. Paul, Rochester, N. Y. (Condensing and Projection Lenses.)
B. B. T. Corp. of America, Atlantic Bldg., Philadelphia, Pa.
Corning Glass Wks, Corning, N. Y. (Flashlight and Signal.)
Deknatel & Sons, J. A., Queens Village, N. Y.
Gilligan Glass Products Co., New Philadelphia, Ohio.
Goerz American Optical Co., C. P., 317 E. 34th, New York.
Jefferson Glass Co., Follansbee, W. Va. (Sign and Flashlight.)
Kliegl Bros. Universal Stage Ltg. Co., 321 W. 50th, New York, N. Y. (Condensing and Projector.)
Macbeth Evans Glass Co., Dept. G, Eastern Division, Charleroi, Pa. (Flashlight.)
North Light Corp., 30 W. 15th, New York, N. Y.
Popper & Sons, Leo, 147 Franklin, New York, N. Y.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill.
Rochester Glass Products Co., 29 N. Water, Rochester, N. Y.
Rodefer Glass Co., Bellaire, O. (Flashlight.)
Sneath Glass Co., Hartford City, Ind. (Sign.)
Stromberg-Carlson Telephone Mfg. Co., 1050 University Ave., Rochester, N. Y.

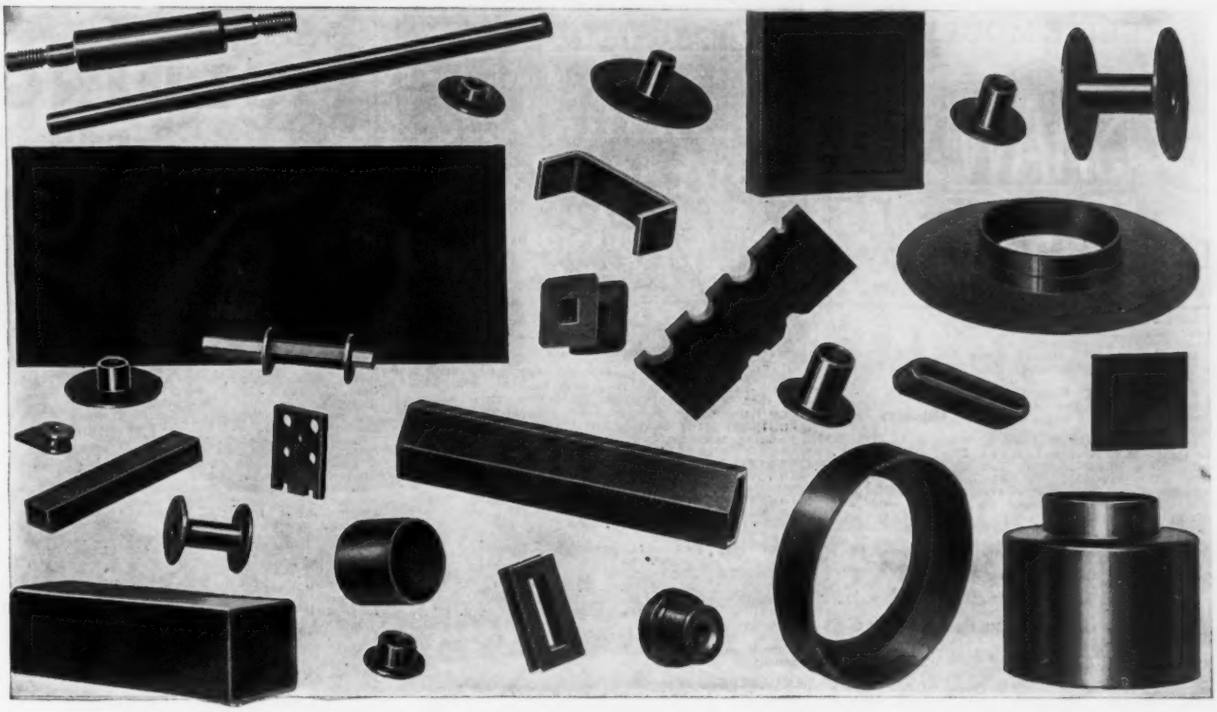
LETTERS, Sign
Glass. Metal.
Adsign Corp, 113 W. 63rd, New York, N. Y.
Chain Products Co., 3924 Cooper Ave., Cleveland, O. (Brass and White Metal.)
Chicago Miniature Lamp Co., 652 W. Lake, Chicago, Ill. (Raised Letters for Signs.)
Eradium. See Pioneer Corporation.
Federal Elec. Co., 6700 S. State, Chicago, Ill. (Metal.)
Gennes & Sons, Inc., L. F., Allentown, Pa.
Heralite. See Pressed Prism Plate Glass Co.
Kolux Glass Sales Co., Kokomo, Ind.
Lu-Mi-Nus Signs, Inc., 2736 Wentworth Ave., Chicago, Ill.
Manhattan Elecl. Supply Co., 190 Sixth Ave., New York, N. Y. (For Gas Signs.)
Opalite Corp., 291 E. Ohio, Chicago, Ill.
Pioneer Corporation, 8308 Yale Ave., Chicago. (Luminous.)
Pressed Prism Plate Glass Co., Chicago, Ill. (Glass.)

LIFTS, Armature
Lifts, Hoists, Jacks, Trucks, Buggies, Floor Cranes.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Co., Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.

LININGS, Socket
Remington Mfg. Co., 937 Barnum Ave., Bridgeport, Conn.

LOCK WASHERS. See Washers, Lock.
LOOP WINDERS & SPREADERS. See Winding Machines, Armature & Field Coil.
LOUD SPEAKER DIAPHRAGMS MATERIAL. See Cloth, Untreated; also Parchment Paper.

LOUD SPEAKERS
Manufacturers Units and Electric Pick-ups for Portable and Built-in Types.
American Reproducer Corp., 55 W. 42nd, New York, N. Y.
A. R. C. See American Reproducer Corp.
Amplion. See Woolf, J. W. & W. L.
Balsa Wood Reproducer Corp., 331 Madison Ave., New York.
Brielle. See Penn Mfg. Co.
Brooklyn Metal Stamping Corp., 739 Atlantic Ave., Brooklyn, N. Y. (Electric Pick-up.)
Cannonball. See Cannon & Miller Co.
Cannon & Miller Co., Springwater, N. Y.
Chelten Electric Co., 4859 Stenton Ave., Philadelphia, Pa.
Conamic. See Operadio Mfg. Co.
Decatur Mfg. Co., 45 Harman St., Brooklyn, N. Y.
Dreher & Son, Chas., 157 Spring, New York, N. Y.
Dynac. See Electrical Products Mfg. Co.
Electrical Products Mfg. Co., Providence, R. I.
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill. (Units.)
Empire United Hat Block Co., 312 E. 22nd, New York.
Engineers Service Co., 25 Church, New York, N. Y. (Kit.)
Ensco. See Engineers Service Co.
Fenco Cone Co., 57 Murray, New York, N. Y. (Kit.)
Fergus Co., 235 Elizabeth Ave., Newark, N. J.
Fidelity Radio Corp., Salt Lake City, Utah.
F. & H. Radio Laboratories, Fargo, N. D.
Globe Technolian Corp., Reading, Mass.
G. R. P. See Penn Mfg. Co.
Grutal Speaker Co., 609 E. Walnut, Des Moines, Iowa.
Jensen Radio Mfg. Co., 338 N. Kedzie Ave., Chicago, Ill.
Kersten Radio Equipment, Inc., 1415 Filiford, Kalamazoo, Mich.
Kyle. See Newcombe-Hawley.
Lata Balsa. See Balsa Wood Reproducer Corp.
Magnavox Co., 4250 Horton, Oakland, Cal. Also Units.
Markone Radio Mfg. Co., 303 Devoe, Brooklyn, N. Y. (Horn.)
Miles Mfg. Co., 191 Joralemon, Brooklyn, N. Y.
Minuet. See Thompson Radio Co.
Molded Wood Products, 219 W. Chicago Ave., Chicago, Ill.
Mozart-Radiocelve. See Fergus Co.
Newcombe-Hawley Lab. of United Reproducers Corp., St Charles, Ill.
Newton Elec'l Mfg. Co., Newton, Mass.
O'Neil Mfg. Corp., West New York, N. J.
Operadio Mfg. Co., St. Charles, Ill.
Peerless. See United Radio Corp.
Penn Mfg. Co., G. R., 231 Mercer, New York, N. Y.
Philadelphia Storage Battery Co., Ontario & C Sts., Philadelphia, Pa.
Philco. See Philadelphia Storage Battery Co.
Platter Cabinet Co., North Vernon, Ind.



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Puropower. See Platter Cabinet Co.
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Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Swoboda Co., Maritime Bldg., Seattle, Wash.
Temple Corp., 5253 W. 65th, Chicago, Ill.
Thompson Radio Co., 25 Church, New York, N. Y.
Ultratone Mfg. Co., 1046 W. Van Buren, Chicago, Ill.
United Radio Corp., 25 Leighton Ave., Rochester, N. Y.
Universal. High Power Telephone Co., Carleton Ave. and Eddy, Seattle, Wash.
Utah Radio Products Co., 1615 S. Michigan Ave., Chicago, Ill. (Also Piano Unit.)
Victor Radio Corp., 4321 N. Western Ave., Chicago, Ill.
Wonderphone. See Universal High-Power Telephone Co.
Woolf, J. W. & W. L., 133 W. 21st, New York, N. Y.
Wright-De Coster, Inc., St. Paul, Minn.
Zisch Engineering Corp., Newark, N. J.

LUGS, Copper
Anderson Mfg. Co., Albert & J. M., 289 A St., Boston, Mass.
Dante Elecl. Mfg. Co., Bantam, Conn.
French Mfg. Co., Waterbury, Conn.
General Electric Co., Schenectady, N. Y.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Wolverine Tube Co., 1433 Central Ave., Detroit, Mich.

LUMINOUS SPECIALTIES

KEY
Luminous Compound .....See C
Pendants (Bulbs) .....See P
Standard Parts .....See S

Acornlite Studios, 675 72nd, Brooklyn, N. Y..... P
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn..... S P
Bryant Electric Co., Bridgeport, Conn..... P
Connecticut Elec. Mfg. Co., Bridgeport, Conn..... S
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.
Eaglelite. See Eagle Elec. Mfg. Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y..... P
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn..... S P
Glow Lite. See Rodale Mfg. Co.
Glow Tip. See Arrow Electric Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Electric Co., Hartford, Conn..... S P
Hubbell, Inc., Harvey, Bridgeport, Conn..... P
Luma & Luma Lite. See Radium Dial Co.
Radieye. See General Electric Co.
Radium Dial Co., 3532 Forbes, Pittsburgh, Pa.... C .. P
Reynolds Spring Co., Jackson, Mich..... S ..
Rodale Mfg. Co., 200 Hudson, New York, N. Y..... P
Seelite. See T. C. Smith & Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia .. P
Spot O Life. See Hart & Hegeman Mfg. Co.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y..... C S P

MACHINE SCREWS. See Screws, Machine.
MACHINE SCREW PRODUCTS. See Screw Machine Products.

MACHINES
Armature Banding. See Banding Machines, Armature
Armature Notching. See Notching Machines, Armature
Balancing. See Balancers, Armature.
Banding. See Banding Machines, Armature.
Cable Armoring. See Wire Manufacturing Machines.
Coil Shaping. See Shaping Machines, Coil.
Coil Taping. See Taping Machines, Coil.
Coil Winding. See Winding Machines.
Commutator Slotting. See Mica Undercutters.
Engraving. See Engraving Machines.
Incandescent Lamp Making. See Machines, Lamp Making
Molded Insulation. See Presses, Molded Insulation.
Perforating. See Perforating Machines.
Porcelain Molding. See Presses, Porcelain Molding.
Radio Tube. See Machines, Lamp Making.
Shaping. See Shaping Machines, Coil.
Slotting. See Mica Undercutters.
Soldering. See Soldering Machines, Commutator.
Spring Making. See Spring Making Machines.
Taping. See Taping Machines, Coil.
Tension. See Tension Machines, Band Wire.
Winding. See Winding Machines.
Wire, Armoring. See Wire Manufacturing Machines.
Wire Drawing. See Wire Drawing Machinery.
Wire Insulator. See Wire Manufacturing Machines.
Wire Measuring. See Wire Manufacturing Machines.
Wire Tension. See Tension Machines, Band Wire.
Wire Wrapping. See Wire Wrapping Machines.

MACHINES, Lamp Making
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Berrenberg, R., 12 Farnham (Roxbury), Boston, Mass (Vacuum Pumps.)

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General Engineering & Supply Co., 160 5th Ave., New York, N. Y. Filament Winder.
Gesco. See General Engineering & Supply Co.
Sleeper & Hartley, Inc., Worcester, Mass.
York Elec. & Machine Co., 30 Penn, York, Pa.

MACHINES, Spring Making. See Spring Making Machines
MACHINES, WIRE MANUFACTURING. See Wire Manufacturing Machines.
MAGNET CHARGERS. See Chargers, Magnet.
MAGNET STEEL. See Steel, Magnet.
MAGNET TESTERS. See Instruments, Portable and Switchboard; also Instruments, Pocket.
MAGNET WIRE MACHINES. See Enameling Machines for Magnet Wire.
MAGNETIC CHUCKS. See Chucks, Magnetic.
MAGNETIC CLUTCHES. See Clutches, Magnetic.
MAGNETOMETERS. See Instruments, Pocket.

MAGNETS, Permanent
Bulleas Co., D. K., Pottstown, Pa.
Ind. Steel Products Co., 4545 S. Western Blvd., Chicago
Rogers Drop Forging Co., Worcester, Mass.
Stromberg-Carlson Tel. Mfg. Co., Rochester, N. Y.
Stieht & Co., H. H., 13 Park Row, New
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.

MALLETS, Raw Hide
Chicago Rawhide Mfg. Co., 1313 Elston Ave., Chicago, Ill.
Crude Felt. See Chicago Rawhide Mfg. Co.
Holbrook Raw Hide Mfg. Co., 748 N. Main, Providence, R. I.

MANGANESE, Battery. See Chemicals, Battery.
MEASURING INSTRUMENTS. See Instruments.
METAL CUTTING OUTFITS. See Welding and Cutting
MECHANICAL RUBBER GOODS. See Rubber Mechanical Goods.
MEGOHMMETERS. See Instruments, Laboratory Standard
MERCURY SWITCHES. See Switches, Mercury.
METAL CLEANERS (Compound). See Cleaners, Metal.
Outfits.
METAL FINISHING. See Plating & Finishing.
METAL MARKING OUTFITS. See Engraving Machines.
METALLIC SHADES. See Shades, Metallic.
METERS. See Instruments.
MICA SHADES. See Shades, Mica.
MICA TAPE. See Tape, Mica.
MICA UNDERCUTTERS. See Slotting Machines & Tools Commutator.

MICA
Asheville Mica Co., Biltmore, N. C.
Asco. See Schoonmaker Insulation Co.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Colonial Mica Co., 136 Seventh, Jersey City, N. J.
Fillion, S. O., 68 Murray, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Gerdau Co., Otto, 533 Canal, New York, N. Y.
Hirsch Mica Co. 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
International Mica Co., 3660 Brandywine, Philadelphia, Pa
Kant Krack. See Huse Liberty Mica Co.
Keene Mica Co., Keene, N. H.
Macallen Co., Boston 27, Mass.
Micabond. See Chicago Mica Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Miralite. See Mitchell-Rand Mfg. Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Micanite. See Mica Insulator Co.
Mica Products Mfg. Co., 54 Greene, New York, N. Y.
Munsell & Co., Eugene, 200 Varick, New York, N. Y.
Nemco. See New England Mica Co.
New England Mica Co., Waltham, Mass.
New England Minerals, Inc., 85 Devonshire, Boston, Mass.
New York Mica & Mfg. Co., Auburn, N. Y.
Peerless. See New England Mica Co.
Prestonite. See Robt. K. Preston Mica Co.
Preston Mica Co., Robt. K., 957 Monadnock Blk., Chicago. (Ground Mica.)
Red Streak. See Huse Liberty Mica Co.
Rogers-Pyatt Shellac Co., 81 Water St., New York. (Imp.)
Schoonmaker Insulation Co., A. O., 34 University Place, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Watson Bros., 170 Purchase, Boston, Mass.

MINIATURE SWITCHBOARD SYSTEMS. See Instruments, Portable and Switchboard.
MIXERS, INSULATION. See Insulation Mixers.

MOLDED
Presses. See Presses, Molded Insulation.
Radio Parts. See Radio Molded Parts.
Shades. See Molded Insulation.

MOLDED INSULATION
Aico. See American Insulator Corp.
Allen & Hills, Inc., Auburn, N. Y.
American Insulator Corp., New Freedom, Pa.
American Machine & Foundry Co., 5520 Second Ave., Brooklyn, N. Y.
Amerine. See American Insulator Corp.
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Asbestos Shingle Slate & Sheathing Co., Ambler, Pa. (Cold.)
Auburn Button Wks., Auburn, N. Y.
Bakelite Corp., 247 Park Ave., New York, N. Y.
Bay State Moulding Co., 1197 Dorchester Ave., Boston.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Beldenmold. See Belden Mfg. Co.
Bell Mfg. Co., 11 Elkins, Boston, Mass. Radio Parts.
Boonton Molding Co., Boonton, N. J.
Boonton Rubber Mfg. Co., 223 Fanny Rd., Boonton, N. J.

Brelite Moulding Corp., 109 Hudson, Jersey City, N. J. (Wood Composition.)
Celoron Co., Bridgeport, Pa.
Cetelite. See Connecticut Molded Products Corp.
Cetec. See Connecticut Molded Products Corp.
Cepco. See Connecticut Molded Products Corp.
Coltrock. See Colt's Patent Firearms Mfg. Co.
Charmond Elec. Corp., 30 Church, New York, N. Y.
Chicago Molded Products Co., 2149 Walnut, Chicago, Ill.
Cincinnati Molding Co., 2037 Florence Ave., Cincinnati, O.
Colonia Co., Hoosick Falls, N. Y.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Compo-Site, Inc., 207 Astor, Newark, N. J.
Condensite. See Bakelite Corp.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Molded Products Corp., Meriden, Conn. (Cold.)
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dayton Insulating Molding Co., 434 E. First, Dayton, Ohio.
Dienoulding Production Co., Canastota, N. Y.
Dimec. See Dayton Insulating Moulding Co.
Durez. See General Plastics, Inc.
Electrose. See Insulation Mfg. Co.
Erinoid Co., Park Row Bldg., New York, N. Y.
Evercool. See Bakelite Corp.
Formica Insulation Co., 4638 Spring Grove Ave., Cincinnati, O.
Garfield Mfg. Co., Garfield, N. J. Composition. (Cold.)
General Electric Co., Schenectady, N. Y.
General Moulded Composition Co., 212 Market, Lynn, Mass.
General Plastics, Inc., 49 Walck Rd., N. Tonawanda, N. Y.
Gummor. See Garfield Mfg. Co.
Hahn Mfg. Co., Harry W., 623 S. San Pedro, Los Angeles, Cal.
Herculite. See Colonia Co.
Hi-Heet. See Insulation Mfg. Co.
Imperial Molded Products Co., 2925 W. Harrison, Chicago.
Imrroco. See Insulation Products Co.
Inda. See American Machine & Foundry Co.
Insulation Mfg. Co., New York Ave. and Herkimer St., Brooklyn, N. Y.
Insulation Products Co., Richland, Pittsburgh, Pa.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
International Insulating Corp., Utyria, O.
Johnson Molding & Tool Co., Weymouth, Mass.
Karolith Corp., 189 13th, Long Island City, N. Y. (Casein plastics.)
Kellite. See Kellogg Switchboard & Supply Co.
Kellogg Switchboard & Supply Co., 1066 W. Adams, Chicago, Ill.
Klagges, Chas., 128 147th, Ozone Park, N. Y.
Kuhn & Jacob Machine & Tool Co., 502 Prospect Ave., Trenton, N. J.
Kurz-Kasch Co., Dayton, O.
Lacanite. See Scranton Button Co.
Macallen Co., Boston, 27, Mass.
Mack Molding Co., Little Falls, N. J.
Makalot. See Johnson Molding & Tool Co.
Manchester Mfg. Co., Manchester Depot, Vt.
Megohom. See Waterbury Button Co.
Micarta Fabricators, Inc., 309 Canal, New York, N. Y.
Micarta. See Westinghouse Elec. & Mfg. Co.
Modern Molded Products Co., Blount and Elm Sts., Providence, R. I.
New England Products Co., 232 Greenwich, New York, N. Y.
Niagara Insul-Bake Specialty Co., 483 Delaware Ave., Albany, N. Y.
Nixon Nitration Works, Nixon, N. J.
Nixonold. See Nixon Nitration Works.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Norloc. See Norton Laboratories, Inc.
Northern Industrial Chemical Co., 11 Elkin, South Boston.
Norton Laboratories, Inc., 1025 Mill, Lockport, N. Y.
Panelyte Corp., Trenton, N. J.
Paramix. See Splitdorf Radio Corp.
Paratherm. See Scranton Button Co.
Phenolite. See Scranton Button Co.
Pruven Compositions Products Corp., Milford, Conn.
Pruvenite. See Pruven Composition Products Co.
Pyrolax. See Cutler-Hammer Mfg. Co.
Recto Mfg. Co., 23 W. 3rd, Cincinnati, O.
Redmonol. See Bakelite Corp.
Rexlite. See Northern Industrial Chemical Co.
Reynolds Spring Co., Jackson, Mich.
Reynoldite. See Reynolds Spring Co.
Reynomold. See Reynolds Spring Co.
Richardson Co., Lockland, Cincinnati, O.
Ridgelite. See Ridgley Trimmer Co.
Ridgley Trimmer Co., Springfield, O.
Schneider Bros., Inc., 312 N. Sheldon Ave., Chicago.
Scranton Button Co., Scranton, Pa.
Shaw Insulator Co., Irvington, Newark, N. J.
Siemon Co., State and Dewey, Bridgeport, Conn.
Specialty Insulation Mfg. Co., Hoosick Falls, N. Y.
Star Insulate. See Insulation Mfg. Co.
Starite. See Insulation Mfg. Co.
Stokes & Smith Co., Summerdale Ave. near Roosevelt Blvd., Philadelphia, Pa.
Textolite. See General Elec. Co.
Thermopiax. See Cutler-Hammer Mfg. Co.
Tegit. See Garfield Mfg. Co.
Union Insulating Co., Parkersburg, W. Va.
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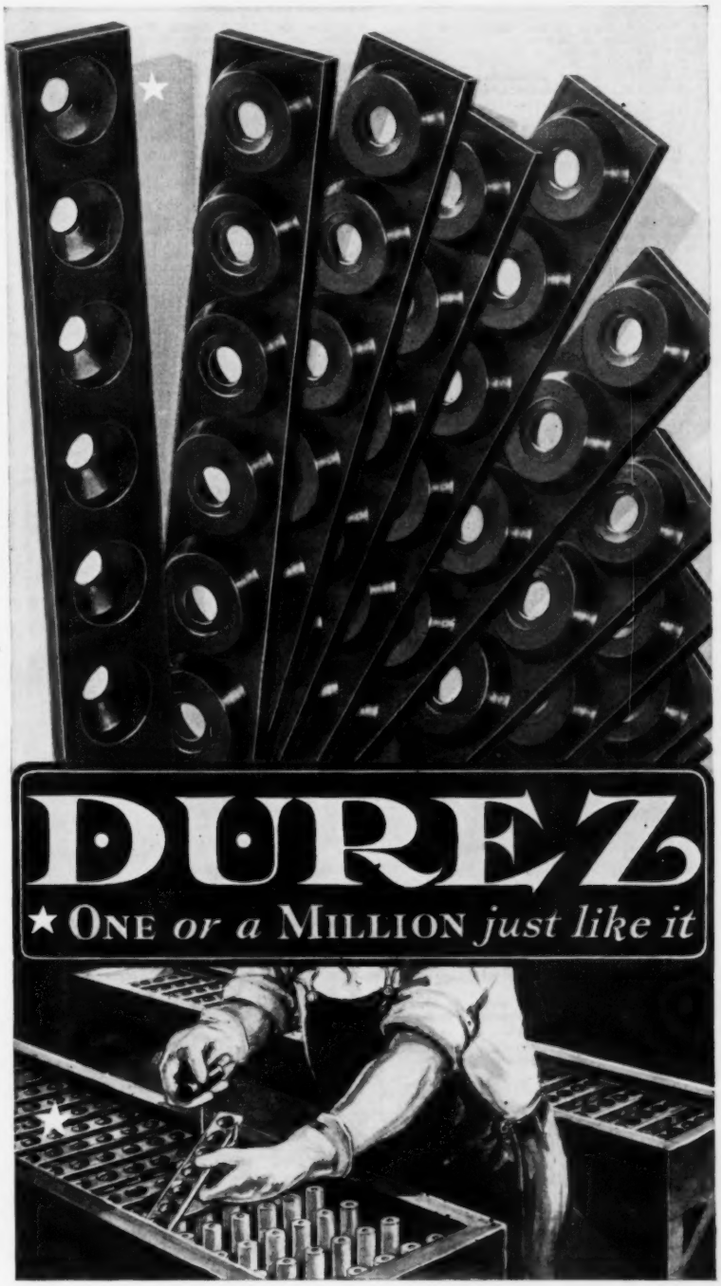

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Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Lohfeld & Co., J. L., 53 Park Place., New York, N. Y.
Palatine Industrial Co., 111 Fifth Ave., New York, N. Y.
Radiotherma, Inc., 45 E. 17th, New York, N. Y.
Sirian Wire Co., 255 Sherman Ave., Newark, N. J.

MONEL METAL
International Nickel Co., 67 Wall, New York, N. Y.

MOTOR CONTROLLERS. See Controllers, Motor.
MOTOR PLATFORM BASES. See Bases, Motor Platform
MOTOR STARTERS. See Controllers, Motor; Switches, Remote Control; Switches, Motor Starting; Safety; Switches Snap (Heavy Duty).

MOTORS
Alternating Current ..... See S
Direct Current ..... See S
Motors, 1 Hp. up ..... See M
Motors Fractional Hp. ..... See F
Universal ..... See U
Aetodector. See Roth Bros. & Co.
Advance Elec. Co., 4311 Maple Ave., St. Louis M F S ..
Allis-Chalmers Mfg. Co., Milwaukee, Wis. ..... M .. S ..
Allis Co., Louis, Milwaukee, Wis. ..... M .. S ..
American Elec. Motor Co., Cedarburg, Wis. ..... M .. .. ..
Apex Elec'l Mfg. Co., 1067 E. 152nd, Cleveland .. F S U
Armor Elec. Mfg. Co., 1020 Holland, Erie, Pa. M .. .. ..
Baldor Elec. Co., 4352 Duncan Ave., St. Louis M F S ..
B-Line. See Brown-Breckmeyer Co.
Bodine Elec. Co., 2254 Ohio, Chicago .... F S U
Bogue Elec. Co., Chas. J., 132 King, New York M .. .. ..
Brown-Brockmeyer Co., Norwood Power Bldg., Dayton, O. ..... M F .. ..
Burke Elec. Co., Erie, Pa. ..... M F S U
B. T. See Allis Co., Louis.
B & R Mfg. Co., 813 Lafayette, Toledo, O. .... .. F .. ..
Century Elec. Co., 1806 Pine, St. Louis, Mo.. M F S ..
Chandeysson Elec. Co., St. Louis, Mo. ..... M .. S ..
Clark, Jr., Elec. Co., James, 600 E. Bergman, Louisville, Ky. ..... M .. .. ..
Cleveland Armature Wks., 4732 St. Clair Ave., Cleveland, O. ..... M .. S ..
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind. ....
Crocker-Wheeler Elec. Mfg. Co., Ampere, N. J. M .. S U
Cushman Elec. Co., Concord N. H. ..... M F S ..
Day-Fan Electric Co., Dept. A, Dayton, O. .... .. F S ..
Diehl Mfg. Co., Elizabeth, N. J. ..... M F S ..
Diverter Pole. See Rochester Elec. Product Co.
Domestic Electric Co., 7209 St. Clair Ave., Cleveland, O. .... S ..
Dumore Co., 25 16th, Racine, Wis. .... F .. U
Eclipse. See Fidelity Elec. Co.
Electric Machinery Co., Minneapolis, Minn.. M .. S ..
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. ....
Electric Specialty Co., 221 South Stamford, Conn. M F S U
Electro-Dynamic Co., Bayonne, N. J. ..... M .. S ..
Emerson Electric Mfg. Co., 2015 Washington Ave., St. Louis, Mo. ..... M F S U
Engberg's Elec. & Mechl. Works, St. Joseph, Mich. ..... M .. S ..
Esco. See Electric Specialty Co.
Fairbanks-Morse & Co., 900 S. Wabash Ave., Chicago, Ill. ..... M F .. ..
Fidelity Elec. Co., Lancaster, Pa. ..... M F S U
Fitzgerald Mfg. Co., Torrington, Conn. .... F .. ..
Fynn Weichsel. See Wagner Elec. Corp.
Galvin Elec. Mfg. Co., 3314 S. Broadway, St. Louis, Mo. .... F .. S
General Elec. Co., Schenectady, N. Y. ..... M F S U
Gilbert Co., A. C., New Haven, Conn. .... F .. U
Hamilton Beach Mfg. Co., Racine, Wis. .... F S U
Hobart Bros. Co., Troy, O. ..... M .. S ..
Holtzer-Cabot Elec. Co., 125 Amory, Boston... M F S ..
Howell Elec. Motors Co., Howell, Mich. ..... M .. S ..
Ideal Elec. & Mfg. Co., Mansfield, O. ..... M .. S ..
Imperial Electric Co., Akron, O. ..... M .. S ..
Janette Mfg. Co., 556 W. Monroe, Chicago .... F S ..
Jantz & Leist Elec. Co., Cincinnati, O. ..... M F .. ..
Jeannin Electric Co., Fassett & N. Y. C. R. R. Toledo, O. ..... M F S ..
Kendrick & Davis Co., Lebanon, N. H. .... F S ..
Kimble Elec. Co., 634 N. Western Ave., Chicago M .. S U
Knapp Elec., Inc., 350 Madison Ave., New York, N. Y. .... F S U
Leland Elec. Co., Dayton, O. .... F S ..
L. E. See Leland Elec. Co.
Lincoln Elec. Co., Cleveland, Ohio ..... M .. S ..
Line-Weld. See Lincoln Elec. Co.
Linzee Elec. Motor Co., Mansfield, O. ..... M .. .. ..
Mando Co., Syracuse, N. Y. .... F ..
Marathon Elec. Mfg. Co., 32 Island, Wausau, Wis. .. F .. ..
Marble-Card Elec. Co., Gladstone, Mich. ..... M .. .. ..
Master Electric Co., Dayton, O. ..... M F S ..

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MC. See General Electric Co.
Michigan Elec. & Mfg. Co., Lake Linden, Mich. .. F S ..
N. C. See Electric Controller & Mfg. Co.
Norfolk. See Walter Elec. Mfg. Co.
North East Elec. Co., Rochester, N. Y. .... F .. U
Northwestern Mfg. Co., 480 Clinton, Milwaukee M .. .. ..
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio .... F S ..
O. K. See Marathon Elec. Mfg. Co.
Osann Co., F., 245 Seventh Ave., New York M .. .. ..
Peerless Elec. Co., 740 W. Market St., Warren, O. M F S U
Polar Cub. See Gilbert Co., A. C.
Pow-R-Full. See Wagner Elec. Corp.
Reco. See Reynolds Electric Co.
Red Band. See Howell Elec. Motors Co.
Reliance Elec. & Engrg. Co., 1042 Ivanhoe Rd., Cleveland, O. ..... M .. S ..
Reynolds Electric Co., 2850 W. Congress, Chicago .. F S ..
Robbins & Myers, Inc., Springfield, O. ..... M F S U
Roth Bros. & Co., Chicago, Ill. ..... M .. S ..
Standard. See Robbins & Myers Co.
Star Elec. Motor Co., Miller St. & N. J. R. R. Ave., Newark, N. J. ..... M .. S ..
Sterling Elec. Motors, Inc., Telegraph Rd. and Atlantic Blvd., Los Angeles, Cal. ..... M .. S ..
Stow Mfg. Co., Binghamton, N. Y. ..... M F S U
Sturtevant Co., 15 Devonshire (Hyde Park), Boston, Mass. ..... M F S U
Sunlight Electrical Mfg. Co., Warren, O. .... F S ..
Super Wick. See Master Elec. Co.
Switch start. See Lincoln Elec. Co.
Triumph Elec. Corp., Carthage, O. ..... M .. S ..
Union Elec. Motor Mfg. Co., Hancock & Oxford Sts., Philadelphia, Pa. ..... M F S ..
U. S. Elec. Mfg. Co., 200 E. Slawson Ave., Los Angeles ..... M .. S ..
Valley Elec. Co., 4221 Forest Park Blvd., St. Louis, Mo. ..... M .. S ..
Wagner Elec. Corp., 6400 Plymouth Ave., St. Louis, Mo. ..... M F S U
Walter Elec. Mfg. Co., Norfolk, Va. ..... M .. S ..
Watson. See Allis Co., Louis.
Weico Uniframe. See Wesche Elec. Co., B. A.
Wesche Elec. Co., B. A., 1622 Vine, Cincinnati M F S ..
Westinghouse Elec. Mfg. Co., East Pittsburgh M F S ..
Willey-Wray Elec. Co., Cincinnati, O. ..... M .. S ..
Woods Mach. Co., S. A., Boston ..... M F S ..
Zobell Elec. Motor Co., Garwood, N. J. ..... M .. S ..

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See also Decalcomania.
American Name Plate Co., 117 Imlay, Brooklyn, N. Y.
Angell Embossing Co., 37 Barney-Smith Co., Dayton, O.
Celoron Co., Bridgeport, Pa.
Chandler Co., Springfield, Mass.
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Electro-Chemical Engraving Co., 52 Vanderbilt Ave., New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y.
Etching Co. of America, 1520 Montana, Chicago, Ill.
General Etching & Mfg. Co., 3070 W. Grand Ave., Chicago, Ill.
Grammes & Sons Inc., L. F., Allentown, Pa.
Premier Metal Etching Co., 14th & Van Alst Ave., Long Island City, N. Y.
Waterbury Button Co., Waterbury, Conn.

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American Mond Nickel Co., Century Bldg., Pittsburgh, Pa.
Driver-Harris Co., Harrison, N. J.
International Nickel Co., 67 Wall, New York, N. Y.
Seymour Mfg. Co., Seymour, Conn.
United States Nickel Co., New Brunswick, N. J.

NOTCHING MACHINES, Armature
Ferracute Machine Co., Bridgeton, N. J.

NUT SETTING MACHINES
Vim Electric Tool Co., 149 Broadway, New York, N. Y.

OHMMETERS. See Istruments, Laboratory Standard; also Instruments, Portable and Switchboard.
OIL-LESS BEARINGS. See Bearings, Oil-less.
OSCILLOSCOPES. See Instruments, Laboratory Standard.

OVENS, Industrial and Laboratory
Annealing, Temper Drawing, Mold Baking, Vulcanising, Drying, Conditioning, Enameling, Japanning.
Vacuum Impregnating.
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Conran, Frederick M., 177 New York Ave., Newark, N. J.
Crawford Oven Co., New Haven, Conn. (Coil Driers.)
Despatch Oven Co., 120 First Ave., N., Minneapolis, Minn.
Detroit Sheet Metal Wks., 1341 E. Milwaukee Ave., Detroit, Mich.
Devine Mfg. Co., J. P., Buffalo, N. Y.
Eberbach & Son Co., Ann Arbor, Mich. (Drying.)
Electric Heat Control Apparatus Co., 245 New Jersey R. R. Ave., Newark, N. J.
Emerson Apparatus Co., Melrose, Mass. (Conditioning.)
Freas Thermo Elec. Co., 1206 Grove, Irvington, N. J.
Gehnrich Indirect Heat Oven Co., Long Island City, N. Y.
General Electric Co., Schenectady, N. Y.
Hayes, C. I., 129 Baker, Providence, R. I.
Heidbrink Co., 2633 Fourth Ave., S., Minneapolis, Minn.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Kenworthy, Chas. F., 198 Piedmont, Waterbury, Conn.
Maehler Co., Paul, 2210 Lake, Chicago, Ill.
Miho Co., 717 Sycamore, Cincinnati, O.
Radio Elec'l Wks., 150 W. 22nd, New York, N. Y.
Sargent & Co., E. H., 155 E. Superior, Chicago, Ill.
Sioux Battery & Mfg. Co., Sioux City, Ia. (Battery.)
Snead & Co., Jersey City, N. J.
Standard Elec. Stove Co., Toledo, Ohio.
Steiner & Co., R. E., 187 E. Kinney St., Newark, N. J.
Stokes Machine Co., F. J., 5926 Tabor Rd. (Olney), Philadelphia.

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OXIDES, Battery. See Chemicals, Battery.

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Federal Metallic Packing Co., Wakefield, Mass.
Packtite. See Federal Metallic Packing Co.

PAINT, Varnish, Lacquer KEY
Varnishes, Insulating ..... See V
Painting, Dipping, Spraying, Vacuum Impregnating.
Paint, Insulating and Acid Proof.. See P
Lacquer, Metal Finishing ..... See L
Acme White Lead & Color Wks., 8250 St. Aubin Ave., Detroit, Mich. L
Ajax. See Sherwin-Williams Co.
Alaka. See Lacquer & Chemical Corp.
American Di-Electrics, Ltd., Hancock and Bodine, Long Island City, N. Y. ..... V .. .. ..
American Lastite Co., 3166 Lincoln Ave., Chicago .. P L
Antakwa Co., 1329 Monawk, Chicago, Ill. .... P .. ..
Arizona Lacquer Mfg. Co., 7 16th, Brooklyn, N. Y. L
Armisc. See Robertson Chemical Co.
Aroloc. See Arizona Lacquer Mfg. Co.
Art-Craft. See Southwestern Paint & Varnish Co.
Atlantic Chemical Co., Coit, Irvington, N. J. L
Atom Chemical Co., 96 E. 10th, New York, N. Y. L
Bakelite Corp., 247 Park Ave., New York, N. Y. L
Benolite Varnish Co., 501 Columbia Bank Bldg., Pittsburgh ..... V P ..
Berry Bros., Leib & Wight, Detroit, Mich. ..... V .. .. ..
Billings-Chapin Co., 1163 E. 40th, Cleveland, O. V .. .. ..
Biwax Corp., 208 S. La Salle, Chicago, Ill. .... P .. ..
Bradley-Hurtz Co., 2626 S. Dearborn, Chicago, Ill. L
Brevolite. See Waukegan Chemical Co.
Calman & Co., Emil, 42 Vernon Blvd., Long Island City, N. Y. ..... V P ..
Carboloid Products Corp., 15 Park Row, New York. V P ..
Celeron Co., Bridgeport, Pa. ..... V .. .. ..
Chinalac. See Dolph Co., John C.
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. ..... V P ..
Code 25. See Mitchell-Rand Mfg. Co.
Columbus Varnish Co., 264 Cozzens, Columbus, O. V .. .. ..
Comulac. See Martindale Elec. Co.
Dolph Co., John C., 168 Emmet, Newark, N. J.. V P ..
Duco. See Du Pont de Nemours & Co.
Du Pont de Nemours & Co., Wilmington, Del. .. P ..
Eastman Kodak Co., Rochester, N. Y. L
Eclipse Paint & Mfg. Co., Cleveland, O. .... P ..
E. B. See Mitchell-Rand Mfg. Co.
Egyptian Lacquer Mfg. Co., 90 West, New York. L
Electric Lacquer. See Dolph Co., John C.
Enamelac. See Robertson Chemical Co.
Ever-Brite Products Co., East Liverpool, O. L
Ferbert-Schorndorfer Co., 12815 Elmwood Ave., Cleveland, O. ..... V P L
Fesco. See Ferbert-Schorndorfer Co.
Franche & Co., 440 Orleans, Chicago, Ill. L
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. ..... V P ..
General Plastics, Inc., 49 Walck Rd., N. Tonawanda, N. Y. ..... V .. .. ..
George Co., P. D., 4153 Bingham Ave., St. Louis, Mo. ..... V .. .. ..
G. E. See General Elec. Co.
Glidden Co., Cleveland, O. ..... V P L
H. B. See Maas & Waldstein Co.
Hilo Varnish Corp., Marcy & Flushing Aves., Brooklyn, N. Y. ..... V P L
Impervious Varnish Corp., 421 Wood, Pittsburgh. V P ..
Insulaterite. See Ohmlac Paint & Refining Co.
Insulvar. See Varflex Corp.
Irvington Varnish & Insulator Co., Irvington, N. J. V P L
Kodalak. See Eastman Kodak Co.
Krakles. See Waukegan Chemical Co.
Lacquer & Chemical Corp., 214-40th St., Brooklyn, N. Y. .... P L
Laqueroid. See Glidden Co.
Liberty. See Antakwa Co.
Linolac. See Mica Insulator Co.
Lowe Bros. Co., 450 E. 3rd, Dayton, O. ..... V P ..
Lucas & Co., John, 322 Race, Philadelphia, Pa.. V P ..
Lucote. See Lucas & Co., John.
Maas & Waldstein, 433 Riverside Ave., Newark, N. J. L
McDougall-Butler Co., Inc., Evans Water & Norton, Buffalo, N. Y. ..... V P ..
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O. ..... V .. .. ..
Mawalac. See Maas & Waldstein.
Mecco. See Henry V. Walker Co.
Mica Insulator Co., 200 Varick St., New York.... V .. .. ..
M. I. C. See Mica Insulator Co.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y. V P ..
Nepto Lac. See Lowe Bros. Co.
Nikolas & Co., G. J., 1227 W. Van Buren, Chicago. L

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14 POINTS

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Test No.		No. 104 Amber MICABOND Sample .025 Thick	No. 102 India MICABOND Sample .025 Thick
1	Splittings	1" x 1" Area	1" x 1" Area
2	Dielectric Strength in volts per mil	1,181	973
3	Surface Resistivity, Megohm ins. x 10^6	Greater than 30	Greater than 30
4	Volume Resistivity, Megohm ins. x 10^6	Greater than 290	Greater than 300
5	Power Factor, per cent	3.2	5.6
6	Dielectric Constant	3.7	5.8
7	Slipping at 500° F.	None	None
8	Compression at 500° F. per cent	.9	1.3
9	Density (Sp. Gr.)	2.54	2.53
10	Transverse Strength, lbs.	7.3	10.6
11	Carbonization	Slight	Slight
12	Corrosion, Resin on Copper	None	None
13	Effect of heat, 200° F.	None	None
14	Bond Content, per cent	4.8	4.9

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Ohmlac Refining Co., 140 S. Dearborn, Chicago, Ill. .. P ..
Opex. See Sherwin-Williams Co.
Ozite. See Standard Underground Cable Co.
P. & B. See Ruberoid Co.
Pacoria Paint Co., 4th & Sedgeley Ave., Philadelphia, Pa. L
Pedigree. See George Co., P. D.
Peninsular Paint & Varnish Co., Detroit, Mich. L
Peerless. See Maas & Waldstein Co.
Proxlin. See Acme White Lead & Color Wks.
Pruett-Schaeffer Chemical Co., Taber, Pittsburgh. .. P L
Reliable Leather Dressing Co., 43 Crescent, Long Island City, N. Y..... V .. ..
Republic Varnish Co., 200 Thomas, Newark, N. J. V .. ..
Roberison Chemical Co., 9805 Meech Ave., Cleveland, O. ..... V P ..
Rockbestine. See Rockbestos Products Corp.
Rockbestos Products Corp., New Haven, Conn..... V .. ..
S. P. C. See Ruberoid Co.
Schenectady Varnish Co., Schenectady, N. Y..... V P ..
Schorndorfer, Ferbert, 12815 Elmwood Ave., Cleveland, O. ..... V P ..
Sherwin-Williams Co., Cleveland, O..... V P L
Sipe & Co., James B., Chamber of Commerce Bldg., Pittsburgh, Pa. L
Southwestern Paint & Varnish Co., 610 Broadway, Kansas City, Mo ..... V P ..
Standard Flexible Comp. Co., 1213 Franklin Trust Bldg., Philadelphia, Pa..... V P ..
Standard Insulation Co., Rutherford, N. J..... V .. ..
Standard Lacquer Co., 621 Broadway, New York, N. Y. L
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa. .... P ..
Standard Varnish Wks., 443 4th Ave., New York. V P L
Sterling Varnish Co., Haysville, Pa..... V .. ..
Toch Bros., 443 4th Ave., New York..... V P L
Truscon Laboratories, Canift & Grand Trunk Railway, Detroit, Mich. ..... V .. ..
2098. See Mitchell-Rand Mfg. Co.
Varflex Corp., Rome, N. Y..... V .. ..
Voltax Co., 99 Reservoir Ave., Bridgeport, Conn. V P ..
Vulcan-Lastite. See American Lastite Co.
Walker Co., Henry V., 17 John St., New York.. L
Waipole. See Robertson Chemical Co.
Waukegan Chemical Co., North Chicago, Ill..... L
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa. V P ..
Zapon Co., Stamford, Conn..... L
Zeliac. See Zeller Lacquer Mfg. Co.
Zeller Lacquer Mfg. Co., 20 E. 49th, New York. L

PANELS (panel) Engraving. See Engraving.
Radio (Metal). See Radio Mountings.
Radio (Molded). See Radio Molded Parts.
Radio (Hard Rubber) See Rubber Hard.
Meters. See Instruments, Portable & Switchboard.

PAPER
Boxes. See Boxes & Wrappers.
Bushings. See Tubes, Paper.
Candles. See Candles, Fixture.
Cores. See Tubes, Paper.
Fibre. See Cloth and Paper.
Fish. See Cloth & Paper.
Insulating. See Cloth and Paper.
Parchment. See Parchment Paper.
Shades. See Shades, Fabric.
Sleeves. See Tubes, Paper.

PARAFFINE. See Wax and Compounds.

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Brown Paper Co., L. L., Adams, Mass.
Chicago Rawhide Mfg. Co., 1301 Elston Ave., Chicago, Ill
New York & Penn Co., 200 5th Ave., New York, N. Y.
Paterson Parchment Paper Co., Passaic, N. J.
Raquette River Paper Co., Potsdam, N. Y.
Reeve & Co., Angel H., 7 Spruce, New York, N. Y.
Rogers Paper Mfg. Co., So. Manchester, Conn.
Special Paper Mfg. Co., 96 Reade, New York, N. Y.
Strype, Fred C., 140 Lafayette, New York, N. Y.
Taylor-Logan Co., Holyoke, Mass.
Union Paper & Twine Co., 116 St. Clair Ave., N. W., Cleveland, O.
Warren Parchment Co., Dexter, N. Y.
Weber Co., F., 1220 Buttonwood, Philadelphia, Pa.
West Carrollton Parchment Co., West Carrollton, O.
Windsor Locks Paper Mills Co., Windsor Locks, Conn.

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Estes & Sons, E. B., 5344 Grand Central Terminal Bldg., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
White Supply Co., 4347 Duncan, St. Louis, Mo.

PENS, Scorching
Gilbert Supply Co., Independence, Iowa.
Little Speedster. See Gilbert Supply Co.
Post Elec. Co., 7 E. 44th, New York, N. Y.
Stylectric. See Post Electric Co.

PERFORATING MACHINES
American Perforator Co., 617 W. Jackson, Chicago, Ill.
Asam Bros., 917 Arch, Philadelphia, Pa.
Asam Wright. See Asam Bros.
Capital Novelty Co., Lincoln, Neb.
Cummings Co., B. F., 4746 Ravenswood Park, Chicago, Ill
Hamilton Engrs. Products Co., Hamilton, Ohio (Music Rolls).

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Anaconda. See American Brass Co.
Elephant Brand. See Phosphor-Bronze Smelting Co.
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Raytheon Mfg. Co., Cambridge, Mass.
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Gray Instrument Co., 64½ W. Johnson, Philadelphia, Pa
Holophane Co., 342 Madison Ave., New York, N. Y.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Luxometer. See James G. Biddle.
Matheva. See Foote, Pierson & Co.
National Lamp Wks of G. E. Co., Cleveland, O.

PICK-UPS, TALKING MACHINE. See Loud Speakers.

PIGTAILS, Commutator. See Brushes, Commutator.
Wire Gauze. See Brushes, Commutator.
Vacuum Cleaner. See Brushes for Vacuum Cleaners.

PINIONS. See Gears and Pinions.

PINION PULLERS. See Pullers, Armature Shaft.

PLASTICS. See Molded Insulation.

PLATES. Name. See Name Plates: Also Decalcomania.
Fixture Outlets. See Fixture Fittings.
Storage Battery. See Plates, Storage Battery.

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Champion. See Englert Mfg. Co.
C. & B. Battery Co., 1535 S. State, Chicago, Ill.
Edes Mfg. Co., Plymouth, Mass.
Englert Mfg. Co., 2500 Jane, Pittsburgh, Pa.
Esto. See New Jersey Storage Battery Co.
Fort Wayne Battery Mfg. Co., 230 E. Fourth, Ft. Wayne.
Handler. See Witherbee Storage Battery Co.
Link & Heinrick, Inc., 555 W. 52nd St., New York, N. Y.
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Universal Battery Co., 3410 S. La Salle, Chicago, Ill.
Witherbee Storage Battery Co., 75 Columbus Ave., New York.

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American Giant. See Connecticut Dynamo Motor Co.
Bogue Elec. Co., Chas. J., 132 King, New York, N. Y.
Burke Elec. Co., Erie, Pa.
Chandeysson Elec. Co., St. Louis, Mo.
Connecticut Dynamox Motor Co., Irvington, N. J.
Conpro. See Eager Elec. Co.
Eager Electric Co., 523 Newell, Watertown, N. Y.
Eclipse. See Fidelity Elec. Co.
Electric Specialty Co., 229 South, Stamford, Conn.
Esco. See Electric Speciality Co.
Fidelity Elec. Co., Lancaster, Pa.
Hanson-Van Winkle-Munning Co., Matawan, N. J.
Hobart Bros. Co., Troy, O.
Holtzer-Cabot Elec. Co., 125 Amory, Boston, Mass.
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Optimus. See Hanson-Van Winkle & Munning Co.
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Diamond Chrome. See U. S. Chromium Corp.
Duro Chrome. See General Chromium Corp.
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Parker Rust-Proof Co., 2177 E. Milwaukee, Detroit, Mich.
Rochester Elec. Products Corp., 89 Allen, Rochester, N. Y.
United Chromium, Inc., 51 E. 42d, New York, N. Y.
Udylite Process Co., 3220 Bellevue Ave., Detroit, Mich. (Rust-Proof Finish.)
U. S. Chromium Corp., Wilkinsburg Sta., Pittsburgh, Pa.

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American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co. Inc., 54 Austin, Newark, N. J.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Interstate Products Corp., 29 Commercial, Newark, N. J.
R. & H. Platinum Works, 709 Sixth Ave., New York.
Wilco. See H. A. Wilson Co.
Wildberg Bros., Smelting & Refining Co., 742 Market, San Francisco, Cal.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

PLUG FUSES. See Fuses and Fuse Wire.

PLUG RECEPTACLES. See Receptacles, Plug.

PLUGS, Flashing. See Flashers, Sign.

PLUGS, Radio. See Radio Receiver Parts.

PLUGS, Attachment
A-1 Bakelite. See Connecticut Elec. Mfg. Co.
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alcor Mfg. Co., 4605 W. Madison, Chicago.
Anselite Elec. Mfg. Co., New Haven, Conn.
Anylite Elec. Co., Fort Wayne, Ind.
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Arre-Grip. See Arrow Elec.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bee-Ell Elec. Mfg. Co., 79 Mercer, New York, N. Y.
Belden Mfg. Co., 2310 B. S. Western Ave., Chicago, Ill. (Special Soft Rubber Plug Furnished with Belden Cords).
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Elec. Co., Bridgeport.

C. H. See Cutler-Hammer Mfg. Co.
Carling Tool & Machine Co., 32 Union Place, Hartford, Conn.
Camco. See Connecticut Elec. Mfg. Co.
Cetelite. See Connecticut Moulded Products.
Circle F Mfg. Co., Trenton, N. J.
Colts Patent Fire Arms Mfg. Co., Hartford, Conn.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Connecticut Moulded Products Corp., Meriden, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond, H. See Hart Mfg. Co.
Dreadnaught. See Cutler-Hammer Mfg. Co.
Eagle Elec. Mfg. Co., Dept. ER4, 50 Hall, Brooklyn, N. Y.
Eastman Mfg. Co., Manitowoc, Wis.
Electric Co., 94 Allyn, Hartford, Conn.
Ericson Mfg. Co., 3257 Bradford Rd., Cleveland, O.
Ester Elec. Mfg. Co., 302 S. Adams, Marion, Ind.
York, N. Y.
Fitzall. See Rodale Mfg. Co.
Gaynor Elec. Co., Inc., Stratford Ave., Bridgeport, Conn.
GE-Flex. See General Electric Co.
General Electric Co., Section W-234, Bridgeport, Conn. (Special Soft Rubber Plug furnished with G. E. Cords.)
Globe Metal Mfg. Co., 2122 E. Hazzard, Philadelphia, Pa.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New
Gripall. See Beaver Mfg. Co.
Handle Cap. See Beaver Mfg. Co.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heetach. See Marks Products Co.
Hemco. See Bryant Electric Co.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
H. & H. See Hart & Hegeman.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Iona Co., Los Angeles, Cal.
Iliffy. See Ester Elec. Mfg. Co.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Marks Products Co., 23 E. 16th, New York.
Metropolitan Electric Mfg. Co., Blvd. at 14th St., Long Island City, N. Y.
Nelco. See Nelson Elec. Co.
Nelson Elec. Co., Plant City, Fla.
P. & S. See Pass & Seymour.
Paragon Elec. Sales Co., 215 S. Fifth, Philadelphia, Pa.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Propp Co., M., 524 Broadway, New York.
Quick Catch. See Hubbell, Inc., Harvey.
Real. See Smith & Co., T. C.
Real Diamond. See Smith & Co., T. C.
Reben Electric Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Reynolds Spring Co., Jackson, Mich.
Reynolite Masterpiece. See Reynolds Spring Co.
Ripple. See Bryant Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York.
Safegard Elec. Appliance Co., 133 S. Twelfth, Philadelphia.
Samson Cutlery Co., 8 Jones, Rochester, N. Y.
Sears, Henry D., 80 Boylston, Boston 11, Mass.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Snapit. See Marks Products Co.
Snoco. See Snow & Co., E. W.
Snow & Co., E. W., Rochester, N. Y.
Spartanette. See Bryant Elec. Co.
Spar Tap. See Bryant Elec. Co.
Speedway Elec. Mfg. Co., 30 Church, New York, N. Y.
Standard. See Cutler-Hammer Mfg. Co.
Suitzall. See Beaver Mfg. Co.
Surefit. See Alcor Mfg. Co.
T. E. C. See Electric Co.
Tedco. See Paragon Elec. Sales Co.
Telltale Tap. See General Elec. Co.
Templus. See Bryant Elec. Co.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trio-Tap. See Rodale Mfg. Co.
Triple Tap. See General Elec. Co.
Twin Tap. See General Elec. Co.
United States Elec. Mfg. Co., 222 W. 14th, New York.
Un-X-Ld. See Speedway Elec'l Mfg. Co.
Utilo Mfg. Co., 320 E. Liberty, Lancaster, Pa.
Weber. See Sears, Henry D.
Wellmade Elec. Mfg. Co., Torrington, Conn.
Wilkites. See Iona Co.
Yankee. See Beaver Mfg. Co.

POCKET METERS. See Instruments, Pocket.

POINTS, Contact
American Platinum Wks., 241 New Jersey Railroad Ave., Newark, N. J.
Baker & Co., Inc., 54 Austin, Newark, N. J. (Gold, Platinum, Silver.)
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J. (Platinum and Silver.)
Cohn, Sigmund, 44 Gold, New York, N. Y. (Platinum.)
Elkon, Inc. (Div. of P. R. Mallory Co.), 350 Madison Ave., New York, N. Y.
Fansteel Products Co., North Chicago, Ill.
Hardy Metal Corp., Seattle, Wash.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Independent Contact Mfg. Co., 545 39th, Union City, N. J. (Tungsten.)
Interstate Products Corp., 29 Commercial, Newark, N. J. (Platinum and Silver.)
King Mfg. Corp., Rano & Crowley Sts., Buffalo, N. Y. (Platinum.)
National Contact Co., 33 W. 60th, New York. (Platinum.)
Nlehoff & Co., C. E., 230 W. Superior, Chicago. (Platinum.)
R. & H. Platinum Works, 709 Sixth Ave., New York.
Spark-O-Metal. See Hardy Metal Corp.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J. (Platinum and Silver.)

POLARITY INDICATORS. See Instruments, Pocket.

POLISHING MACHINES, WIRE. See Wire Polishing Machines.

PORCELAIN
Bushings. See Bushings, Box & Cabinet.
Liquid. See Cement, Liquid Porcelain.
Molding Machine. See Presses, Porcelain Molding.
Reflectors (Enameled). See Reflectors, Porcelain Enameled.
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Cook Pottery Co., Trenton, N. J.
Corns China Co., Wellsville, O.
Crowley & Co., Henry L., 545 N. Arlington Ave., East Orange, N. J.
Electrical Refractories Co., East Palestine, O.
Globe Porcelain Co., Mulberry St. and St. Joes Ave., Trenton, N. J.
Hartford Faience Co., Hartford, Conn.
Hub-Way Mfg. Co., Hubbard, Ohio.
Illinois Electric Porcelain Co., Macomb, Ill.
Imperial Porcelain Wks., Canal and Mulberry, Trenton, N. J.
Knox Porcelain Corp., Knoxville, Tenn.
Louthan Mfg. Co., East Liverpool, O.
Mercer Porcelain Co., Trenton, N. J.
Metsch Refractories Co., East Liverpool, Ohio.
National Porcelain Co., Trenton, N. J.
New Jersey Porcelain Co., Trenton, N. J.
Nu Blue. See Star Porcelain Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y.
Porcelaye. See Burgess & Co.
Porcelain Products, Inc., Findlay, Ohio.
Square D Company, Detroit, Mich.
Standard & Specialty Porcelain Co., Sun Prairie, Wis
Star Porcelain Co., Muirhead St., Trenton, N. J.
Thomas & Sons Co., R., Lisbon, O.
Trenic Porcelain Co., East Liverpool, Ohio.
Union Elec'l Porcelain Wks., Inc., Trenton, N. J.
Washington Porcelain Co., Washington, N. J.
Woolley, Inc., W. Douglas, East Liverpool, O.

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Colonial Insulator Co., Akron, Ohio.
Maddocks Sons, John, Trenton, N. J.
Ohio Pottery Co., Zanesville, Ohio.
Robinson Clay Products Co., Akron, Ohio.

POSTS, Binding

Binding Posts, Switch Parts, Stop Points, Contacts, Arms, Levers. See also Radio Mountings.
American Radio Hardware Co., 135 Grand, New York.
Bunnell & Co., J. H., 32 Park Pl., New York, N. Y.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
DeJur-Amsco Corp., 418 Broome, New York, N. Y.
Eby Mfg. Co., Inc., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Ensign. See Eby Mfg. Co., H. H.
Eureka. See Frank W. Morse Co.
Grammes & Sons, Inc., L. P., Allentown, Pa.
Gray Bros., Plano, Ill.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Hoosick Falls Radio & Electrical Parts Mfg. Co., Hoosick Falls, N. Y.
King. See Morse Co., Frank W.
Morse Co., Frank W., 289 Congress, Boston. (Spring Grip)
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Polk, J. L., 41 Bell Ave., Troy, N. Y.
Premier Elec. Co., Dept. 1223, 3800 Ravenswood Ave., Chicago, Ill.
Quality. See H. H. Eby Mfg. Co.
Queen. See Morse Co., Frank W.
Thomaston Mfg. Co., Thomaston, Conn.
Waterbury Button Co., Waterbury, Conn.

POTENTIOMETERS (Instruments). See Instruments, Laboratory Standard.

POTENTIOMETERS (Radio Control). See Radio Receiver Parts.

POWDERED CARBON. See Carbon, Powdered.

POWER TRANSMISSION CHAIN. See Chain, Power Transmission.

PRESS BOARD. See Cloth and Paper.

PRESSES, Armature Coil

Comstock Mfg. Co., Wilkes-Barre, Pa.

PRESSES, ARMATURE NOTCHING. See Notching Machines, Armature.

PRESSES, Molded Insulation

Burroughs Co., 246 N. Tenth, Newark, N. J.
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Elmes Engrg. Works, Chas. F., 222 N. Morgan, Chicago, Ill
Evans Engrg. Works, Chas. E., 1002 Fulton, Chicago, Ill
Farquhar Co., A. B., York, Pa.
Southwark Fdy. & Mach. Co., 400 Washington Ave., Philadelphia, Pa.
Stokes Mach. Co., F. J., 5926 Tabor Rd., Olney, Philadelphia, Pa.
Terkelson Machine Co., 326 A, Boston, Mass.
Watson-Stillman Co., 75 West St., New York, N. Y
Wood & Co., R. D., Florence, N. J.

PRESSES, Porcelain Molding

Baird, Andrew, 2715 Newark, Detroit, Mich.

PRESSES, Punching

Bench Presses—Power Presses; for Punching & Stamping Sheet Metal.
Ams Machine Co., Max, 101 Park Ave., New York, N. Y
Baird Machine Co., Bridgeport, Conn.
Bliss Co., E. W., 53rd St. & Second Ave., Brooklyn, N. Y
Dunning & Boschert Press Co., 329 W. Water, Syracuse
Federal Press Co., Elkhart, Ind.
Ferracute Machine Co., Bridgeton, N. J.
Hyro Mfg. Co., 200 Varick, New York, N. Y.
Loshbough-Jordan Tool & Machine Co., Elkhart, Ind.
Peck, Stow & Wilcox Co., Southington, Conn.

PRISMS, Chandelier. See Crystals, Chandelier.

PROJECTOR LENSES. See Lenses.

PULLERS, Armature Shaft

Motor Pulley, Shaft & Pinion Pullers & Extractors
Allen Electric & Equipment Co., Kalamazoo, Mich.
Big Buster. See Premier Elec. Co.
Crane Puller Co., Waltham, Mass.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Duff Mfg. Company, Pittsburgh, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Little Giant. See Premier Elec. Co.
Peerless. See Electric Service Supplies Co.

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Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.

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Rockwood Mfg. Co., Indianapolis, Ind.
Sprucolite Co., Bloomfield, N. J.

PUMPS, Oil Burner

Janette Mfg. Co., 556 W. Monroe, Chicago, Ill.
Milwaukee Tank Wks., Milwaukee, Wis.
Monroe Machine Tool Co., 737 W. Jackson Blvd., Chicago.
Reflex. See Simplex Oil Heating Co.
Simplex Oil Heating Co., 1199 Eddy, Providence, R. I.
Teesdale Mfg. Co., 427 Market, Grand Rapids, Mich.
Zisch Engineering Co., 39 Ave. L, Newark, N. J.

PUMPS, Vacuum

To Exhaust Incandescent Lamps.
Arrow Machine Co., 537 Hackensack Plank Rd., Union City, N. J.
Beach-Russ Co., 50 Church, New York, N. Y.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Dunham Co., C. A., 450 East Ohio, Chicago, Ill.
Elmer & Amend, 205 3rd Ave., New York, N. Y.
Eisler Engineering Co., 770 S. 13th, Newark, N. J.
General Electric Co., Schenectady, N. Y.
Hubbard's Sons, Norman, 1 Carlton Ave., Brooklyn, N. Y.
Leiman Bros., 23 Walker, New York, N. Y.
Packard. See Hubbard's Sons, Norman.

PUNCHING PRESSES. See Presses, Punching.

PUNCHING and BENDING, Sheet Steel

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Niagara Mach. & Tool Wks., Buffalo, N. Y.

RACKS, Wire Reel

(With Tension Device Attached).
Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Elec'l Wks., P. E., 1829 Chouteau Ave., St. Louis, Mo. (Tensionless Dereeler)
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Elec. Co., Schenectady, N. Y. (Tension Indicator.)
Mutual Foundry & Machine Co., Atlanta, Georgia.
Segur. See Electric Service Supplies Co.

RADIO CIRCUIT COMPONENTS

This heading includes Inductances (Coils), Capacitors (Condensers), Fixed Resistances, Grid Leaks, Transformers, Choke Coils, and Filters, also Amplifier Units and Kits.
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Acme Products Co., Boston, Mass.
Acme Wire Co., New Haven, Conn.
Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Aero Products, Inc., 1772 Wilson Ave., Chicago, Ill.
Air-King Products Co., 216 Wallabout, Brooklyn, N. Y.
Ajax Elec. Specialty Co., St. Louis, Mo.
Alden Mfg. Co., Springfield, Mass.
All-American Mohawk Corp., 4201 Belmont Ave., Chicago.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Amerchoke. See American Transformer Co.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
American Transformer Co., Newark, N. J
Amperite Rheostat. See Radiall Co.
Arco Elec'l Corp., 211 E. Columbia, Fort Wayne, Ind.
Arctic. See Premier Elec. Co.
Audioformer Transformer. See Pacent Electric Co.
Autoformer. See Thordarson Elec. Mfg. Co.
Automotive Parts Mfg. Co., 70 Washington St., Brooklyn,
B-Conomizer. See Pilot Elec. Mfg. Co.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bonine. See Turn-it Radio Sales.
Branston Co., Chas. A., 297 Washington, Buffalo, N. Y.
Bremer-Tully Mfg. Co., 520 S. Canal, Chicago, Ill.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn, N. Y.
Browning-Drake Corp., 110 Brookline, Cambridge, Mass.
Buffer. See Aerovox Wireless Corp.
Buffalo. See De Jur-Amsco Corp.
Camfield. See Columbia Metal Products Co.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Capacigrad. See Pilot Elec. Mfg. Co.
Cardwell Mfg. Corp., Allen D., 81 Prospect, Brooklyn, N. Y.
Carter Mfg. Co., 6300 Euclid Blvd., East Cleveland, O.
Central Radio Corp., Beloit, Wis.
Centraline. See Pilot Elec. Mfg. Co.
Certified Condenser. See Radio Condenser Co.
Chelten Elec. Co., 4859 Stenton Ave., Philadelphia, Pa.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Clarostat Mfg. Co., 281 N. Sixth, Brooklyn, N. Y. (Radio Resistance.)
Cole Radio Mfg. Corp., 536 Bloomfield Ave., Bloomfield, N. J.
Columbia Metal Products Co., 360 E. Grand Ave., Chicago,
Concertone. See Chicago-Jefferson Fuse.
Connectoralds. See Alden Mfg. Co.
Continental Carbon, Inc., Cleveland, O.
Continental. See Gardiner & Hepburn, Inc.
Counterphase Kit. See Bremer-Tully Mfg. Co.
Cresradio Corp., 166-32 Jamaica Ave., Jamaica, N. Y.
Crefot. See Premier Elec. Co.
Daven Corp., 158 Summit, Newark, N. J. (Kits)
DeForest Radio Co., Jersey City, N. J.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Diamond Weave Coil. See Sickles Co., F. W.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Dubilier Condenser Corp., 4377 Bronx Blvd., New York.
Dumont Elec. Co., 40 W. 17th, New York, N. Y.
Durastran. See Dubilier Condenser Corp.
Durham & Co., 1936 Market, Philadelphia, Pa.
Dymac. See Electrical Products Mfg. Co.
Dynohmic. See Lynch, Inc.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I. (Kit.)
Electrical Research Laboratories, 2500 Cottage Grove Ave., Chicago, Ill.
Electro Motive Engineering Corp., 127 W. 17th, New York.
Elkay. See Langbein Kaufman Radio Co.
Elkon, Inc., 350 Madison Ave., New York, N. Y.
El Menco. See Electro Motive Engineering Co.
Equamatic Kit. See Karas Elec. Co.
Equitrol. See Cardwell Mfg. Corp.
Euphonic. See Bremer-Tully Mfg. Co.
Excelsior Radio Corp., 216 Wallabout, Brooklyn, N. Y.
E-Z. See Polymet Mfg. Corp.
Faradon. See Wireless Specialty Apparatus Co.
Fast Co., John E., Crawford & Barry Ave., Chicago, Ill.
Ferranti, Inc., 130 W. 42nd, New York, N. Y.
Filatrol. See De Jur-Amsco Corp.
Filtrola. See All-American Mohawk Corp.
Flechtheim Co., A. M., 136 Liberty, New York, N. Y.
Ford Radio & Mica Corp., 113 Bleecker, New York, N. Y.
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind.
F. & H. Radio Laboratories, Fargo, N. D.
Gardiner & Hepburn, Inc., 611 Widener Bldg., Philadelphia, Pa.

General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
General Transformer Corp., 900 W. Jackson Blvd., Chicago.
General Winding Co., 214 Fulton, New York, N. Y.
Gen-Win. See General Winding Co.
Giastor. See Daven Corp.
Globar Corp., Niagara Falls, N. Y.
Glo-Dial. See Wireless Radio Corp.
Gray & Danielson Mfg. Co., 260 1st, San Francisco, Cal.
Haildorsen Co., 4745 N. Western Ave., Chicago, Ill.
Hammarlund Mfg. Co., 424 W. 33rd, New York, N. Y.
Hardwick, Hindle, Inc., 123 Greenwich, New York, N. Y.
Harmonik. See Karas Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (TRF Kits.)
Heath & Co., Geo. W., 260 First Ave., Newark, N. J.
Hedgehog Transformer. See Premier Elec. Co.
Heinemann Elec. Co., Philadelphia, Pa.
Hi-Q Kit. See Hammarlund.
Hum-Dinger. See Clarostat Mfg. Co.
Hy-Wat. See Electro Motive Engineering Corp.
Igrad Condenser & Mfg. Co., 26 Avenue D, Rochester, N. Y.
Infra-Dyne. See Gray & Danielson Co.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa.
Isograd, Isoleak. See Pilot Elec. Mfg. Co.
J-M-P, Mfg. Co., 3329 Fond du Lac Ave., Milwaukee, Wis.
Karas Elec. Co., 4040 N. Rockwell, Chicago, Ill.
Kelford. See American Specialty Co.
Kenyon Transformer Co., 122 Cypress Ave., New York, N. Y.
Kilograd. See Pilot Elec. Mfg. Co.
Kroblack. See Mountford, C. E.
Kuprox. See Kodel Radio Corp.
Langbein-Kaufman Radio Co., 62 Franklin, New Haven, Conn.
Lavite. See Aerovox Wireless Corp.
Lautz Mfg. Co., 245 N. J. R. R. Ave., Newark, N. J. (Radio Resistance).
Lekeless. See Benjamin Elec. Mfg. Co.
Lemnia. See General Winding Co.
L. M. C. See Lautz Mfg. Co.
Loftin-White. See Hammarlund Mfg. Co.
Loless. See Wireless Radio Corp.
Lynch, Arthur H., 1775 Broadway, New York, N. Y.
Marco. See Martin-Copeland Co.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Maxitran. See Electrical Research Laboratories.
Mayolian Corp., 1668 Webster Ave., New York, N. Y. (Tone Filter.)
Meggit. See Cole Mfg. Corp.
Melco-Supreme. See De Jur-Amsco Corp.
Melcoupler. See Robertson-Davis Co.
Meloformer. See Robertson-Davis Co.
Metaleak. See Dubilier Condenser Corp.
Metrallgn. See General Instrument Corp.
Micadon Condenser. See Dubilier Condenser Corp.
Micamold Radio Corp., 1087 Flushing Ave., Brooklyn, N. Y. (Amplifier Kit.)
Mica-Static. See Dubilier Condenser Corp.
Micon Condenser. See Dubilier Condenser Corp.
Microcondenser. See Sterling Mfg. Co.
Microgrid. See Pilot Elec. Mfg. Co.
Micrometric. See Karas Elec. Co.
Microstat. See Premier Elec. Co.
Midline. See Hammarlund Mfg. Co.
Modern Electric Mfg. Co., Toledo, O.
Mountford, C. E., 30 Sullivan, New York, N. Y.
Muter Co., Leslie F., 76th St. and Greenwood Ave., Chicago, Ill. (Amplifier Kits.)
National Co., 61 Sherman St., Malden, Mass.
Neutrs-Grad. See Pilot Elec. Mfg. Co.
New York Coil Co., Mount Clare, Pa.
Nutmeg. See Hart & Hegeman Mfg. Co.
Ohio Carbon Co., 8215 Almira Ave., Cleveland, O.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill. (Resistance.)
Orthometric. See Karas Elec. Co.
Orthophone. See De Jur-Amsco Corp.
Pacent Electric Co., 91 7th Ave., New York, N. Y.
Pam. See Samson Elec. Co.
Panatrol. See Wireless Radio Corp.
Perry Elec'l Resistor Corp., 230 New Main St., Yonkers, N. Y.
Phasatrol. See Electrad, Inc.
Philmore Mfg. Co., 106 7th Ave., New York, N. Y.
Piander. See De Jur-Amsco Corp.
Pierce Airo. See United Scientific Laboratories.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Pilotran. See Pilot Elec. Mfg. Co.
Potter Mfg. Co., North Chicago, Ill.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Power Box. See Scott Sales Co.
Powerohm. See International Resistance Co.
Powrad, Inc., 486 Johnson Ave., Brooklyn, N. Y.
Precision Coil Co., 122 Greenwich, New York, N. Y.
Precise Mfg. Corp., 254 Mill, Rochester, N. Y.
Premier Elec Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Protectoraid. See Alden Mfg. Co.
Pyrohm. See Aerovox Wireless Corp.
Radiall Co., 50 Franklin, New York, N. Y.
Radio Appliance Corp., Springfield, Mass.
Radio Condenser Co., Thorn & Copewood, Camden, N. J.
Radio Engrg. Laboratories, 100 Wilbur Ave., Long Island City, N. Y. (Short Wave Kit.)
Radioloc Switch. See Cutler-Hammer Mfg. Co.
Radio Receptor Co., 106 7th Ave., New York.
Radiostat. See Allen-Bradley Co.
Raola. See Modern Elec. Mfg. Co.
Rauland-Lyric. See All American Mohawk Corp.
Receptrad. See Radio Receptor Co.
Reesonator. See F. & H. Radio Laboratories.
Regal. See American Specialty Mfg. Co.
Reliable Parts Mfg. Co., Wellington, O.
Remler. See Gray & Danielson Co.
Resistaformer. See Aerovox Wireless Corp.
Resistograd. See Pilot Elec. Mfg. Co.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent), Hatheway & Co., 16 Hudson, New York, N. Y.
Roberts Condenser. See Hammarlund Mfg. Co.
Robertson-Davis Co., 412 Orleans, Chicago, Ill.
Samson Elec. Co., Canton, Mass. (TRF Kits.)
Sangamo Elec. Companies, Springfield, Ill.
Scanlan Elec. Mfg. Co., 1113 N. Franklin, Chicago, Ill. (Output Transformers.)
Scovill Mfg. Co., Waterbury, Conn.
Senior. See All American Mohawk Corp.
Sensory. See Heinemann Electric Co.
Sevison Magneto Engr. Co., 397 Phillips, Toledo, O.
Sickles Co., F. W., 130 Union, Springfield, Mass.

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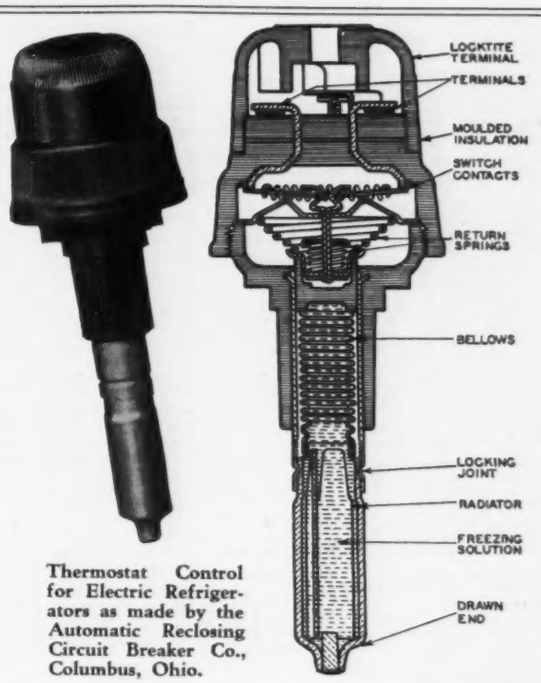

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Silver-Marshall, Inc., 846 W. Jackson Blvd., Chicago. (Amplifier Kits.)
Silvertone. See Radio Receptor Co.
S. L. S. See Wireless Radio Corp.
S. L. T. See General Instrument Corp.
Somersolo. See DeForest Radio Co.
Splitmeter. See Premier Electric Co.
Sprague Specialties Co., Dept. M., Quincy, Mass.
Standard Transformer Co., Warren, O.
Sta-Put. See Martin-Copeland Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, O.
Stromberg-Carlson Tel. Mfg. Co., 1060 University Ave., Rochester, N. Y.
Submariner. See J-M-P Mfg. Co.
Super Multiformer. See Precise Mfg. Corp.
Supertran Transformer. See Ford Radio & Mica Co.
Symphony. See Modern Elec. Mfg. Co.
Synerodenser. See Precise Mfg. Corp.
Tandem. See Bremer-Tully Mfg. Co.
Telemonic Coil. See Condenser Corp. of America.
Telos Coil. See Condenser Corp. of America.
Thompson-Levering Co., 351 N. 57th, Philadelphia, Pa.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago
Tobe Deutschman Co., Canton, Mass.
Tone Control. See Sprague Specialties Co.
Toroid. See All American Mohawk Corp.
Torostyle. See Bremer-Tully Mfg. Co.
Transcript-Clapp Kit. See Samson Electric Co.
Truphonic Amplification. See Alden Mfg. Co.
Tunadapta. See Lynch, Arthur H.
Twin-aud. See Peerless Radio Co.
Twin-Eight Transformers. See Bodine Electric Co.
Two-Ten & Two-Eleven. See Silver-Marshall.
Tyrman Elec. Corp. 143 W. Austin Ave., Chicago, Ill.
Ultra Vario. See Bruno Radio Corp.
Universier Condenser. See Auburn Button Works.
Universal Electro Chemical Corp., 30 W. 15th, New York.
Universal Winding Co., Boston, Mass.
Variall Condenser. See Muter Co.
Volta. See Universal Electro Chemical Corp.
Waterbury Button Co., Waterbury, Conn.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn, N. Y.
Wireless Specialty Apparatus Co. (J. P.), Boston, Mass.
RADIO HARDWARE. See Radio Mountings.

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Coil Mountings, Coil Sliders and Rods, Switches, Detectors, Detector and Grid Leak Mountings, Panel Brackets, Special Radio Hardware & Trimmings, Metal Dials, Metal Panels, etc.

Aerovox Wireless Corp., 80 Washington, Brooklyn, N. Y.
Alden Mfg. Co., Brockton, Mass.
American Radio Hardware Co., 135 Grand, New York.
Bonza. See Haydon & Haydon.
Carborundum Co., Niagara Falls, N. Y. (Detector.)
Chapman Machine Co., Terryville, Conn.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
Durham & Co., 1936 Market, Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Etched Products Corp., 90 Tenth, Long Island City, N. Y. (Metal Panels.)
Eureka. See Morse Co Frank W.
General Etching & Mfg. Co., 3072 West Grand Ave., Chicago, Ill. (Metal Panels & Escutcheons.)
Globe Technolian Corp., Reading, Mass.
Glodial. See Wireless Radio Corp.
Hart & Hegeman Mfg. Co., Hartford, Conn.
Haydon & Haydon, 167 Chambers, New York, N. Y.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th and Greenwood Ave., Chicago.
Na-Ald. See Alden Mfg. Co.
Unlon Insulating Co., 296 Broadway, New York, N. Y.
Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.
RADIO PANEL ENGRAVING. See Engraving, Radio Panel.

RADIO RECEIVER PARTS

Rheostats, Sockets, Plugs, Jacks.
Acme Elec. & Mfg. Co., 1652 Rockwell, Cleveland, Ohio.
Alden Mfg. Co., Springfield, Mass.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
American Specialty Mfg. Co., 165 Holland Ave., Bridgeport, Conn.
Automotive Equipment Co., 317 Halsey, Newark, N. J.
B. M. S. See Brooklyn Metal Stamping Corp.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. (Multiple Plugs.)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Brach Mfg. Corp., L. S., 120 Sussex Ave., Newark, N. J.
Brooklyn Metal Stamping Corp., 718 Atlantic Ave., Brooklyn.
Cabelug. See Jones, Howard B.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Also Socket Adapters.)
Central Radio Laboratories, 14 Keefe Ave., Milwaukee.
Centralab. See Central Radio Laboratories.
Clarostat Mfg. Co., 285 N. Sixth, Brooklyn, N. Y.
Cle-Ra-Tone. See Benjamin Elec. Mfg. Co.
D. A. Radio Co., 30 Hollister, Buffalo, N. Y.
De Jur-Amsco Corp., 418 Broome, New York, N. Y.
De Vsau. See Stanley & Patterson.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
Duostat. See De Jur-Amsco Corp.
E-Z. See Polymet Mfg. Corp.
Eby Mfg. Co., H. H., 4710 Stenton Ave., Philadelphia, Pa.
Electrad, Inc., 173 Varick, New York, N. Y.
Electrical Products Mfg. Co., Providence, R. I.
Fantail Plug. See Brooklyn Metal Stamping Corp.
Frost, Herbert H., 1142 W. Beardsley, Elkhart, Ind.
Gem-Jac. See Frost, Herbert H.
General Instrument Corp., 225 Varick, New York, N. Y.
General Radio Co., 30 State, Cambridge, Mass.
Gray & Danielson Mfg. Co., 260 First, San Francisco, Cal.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Heinemann Elec. Co., Philadelphia, Pa.
Imp. See Carter Radio Co.
Jones, Howard B., 2226 Wabansia, Chicago, (Multiple Plug.)
Klosner Radio Corp., 1022 E. 178th, New York, N. Y.
Martin-Copeland Co., 101 Sabin, Providence, R. I.
Modu-Plug. See Central Radio Lab.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Muter Co., Leslie F., 76th & Greenwood Ave., Chicago.
Nutmeg. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Pacent Elec. Co., 91 Seventh Ave., New York, N. Y.
Pan-Tab Jack. See Frost, Herbert H.
Philmore Mfg. Co., 106 Seventh Ave., New York, N. Y.
Pilot Elec. Mfg. Co., 323 Berry, Brooklyn, N. Y.
Polymet Mfg. Corp., 599 Broadway, New York, N. Y.
Premier Elec. Co., Dept. 1323, 3800 Ravenswood Ave., Chicago, Ill.
Recto Mfg. Co., 23 W. Third, Cincinnati, Ohio
Robertson-Davis Co., 361 W. Superior, Chicago, Ill.
Royalty. See Electrad, Inc.
Samson Elec. Co., Canton, Mass.
Socostat. See D. A. Radio Co.
Stanley & Patterson, 150 Varick, New York, N. Y.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio
Tubestat. See Muter Co.

Wireless Radio Corp., Varick Ave. & Harrison Pl., Brooklyn.
Yaxley Mfg. Co., 9 S. Clinton, Chicago, Ill.

RADIO RECTIFIER TUBES

Armstrong Elec. & Mfg. Co., 351 Halsey, Newark, N. J.
Cable Supply Co., 80 Union Square, New York, N. Y.
Ceco Mfg. Co., 702 Eddy, Providence, R. I.
Conneway Elec. Laboratories, 406 Jefferson, Hoboken, N. J.
Cunningham, Inc., E. T., 370 Seventh Ave., New York, N. Y.
DeForest Radio Co., Franklin St. & Central Ave., Jersey City, N. J.
Diamond Vacuum Products Co., 4053 Diversey Ave., Chicago
Gold Seal Electrical Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
La Salle Radio Corp., Div. of Matchless Elec. Co., 145 W. Austin Ave., Chicago, Ill.
Manhattan Elect. Supply Co., 190 Sixth Ave., New York,
Northern Mfg. Co., 307 Ogden, Newark, N. J.
Paramount Mfg. Co., 79 Orange, Newark, N. J.
Perryman Electric Co., 23 W. 60th, New York, N. Y.
Radio Corp. of America, 233 Broadway, New York.
Raytheon Mfg. Co., Kendall Square Bldg., Cambridge, Mass.
Revall Mfg. Co., 71 Euclid Bldg., Cleveland, O.
Sonatron Tube Co., 1020 S. Central Park Ave., Chicago, Ill.
Specialty Appliance Co., 6611 Euclid Ave., Cleveland, Ohio.
Sylvania Products Co., Emporium, Pa.
Televocal Corp., 583 Twelfth, West New York, N. J.
United Radio & Elec. Corp., 500 Chancellor Ave. Irvington, N. J.

RADIO TRANSFORMERS. See Radio Circuit Components.
RADIO TUBE BASE BRANDERS. See Engraving Radio Panel.
RADIO TUBE BASES. See Radio Molded Parts.
RADIO TUBE BULBS (Unfinished). See Bulbs Glass.

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Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo.
Alden Mfg. Co., Brockton, Mass. (Adapters.)
Alpbus. See Alpha Radio Supply Co.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Alpstrand. See Alpha Radio Supply Co.
American Braiding Co., Holyoke, Mass.
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Birnbach Radio Co., 254 W. 31st St., New York, N. Y.
Blue Ribbon. See Crescent Braid Co.
Brach Mfg. Co., L. S., Newark, N. J.
Carter Radio Co., 300 S. Racine Ave., Chicago, Ill. (Adapters.)
Connectoralds. See Alden Mfg. Co.
Cornish Wire Co., 30 Church, New York, N. Y.
Corwico. See Cornish Wire Co.
Crescent Braid Co., Providence, R. I.
Crescent Insulated Wire & Cable Co., Trenton, N. J.
De Luxe, 50 W. Houston, New York, N. Y.
Diamond Braiding Mills, Chicago Heights, Ill.
Echo. See Cornish Wire Co.
Enterprise Mfg. Co., Third & Dauphin Sts., Philadelphia, Pa. (Adapters).
Frost, Inc., Herbert H., 1142 W. Beardsley, Elkhart, Ind. (Adapters.)
Hatfield Rubber Wks., Inc., Hillside, N. J.
Lusterized. See American Braiding Co.
Manhattan Insulated Wire Co., 17 W. 60th St., New York.
Power, Inc., Harold J., Medford Hillside, Mass. (Adapters).
Radio Receptor Co., 106 Seventh Ave., New York, N. Y. (Adapters.)
Rigs. See Birnbach Radio Co.
Sterling Mfg. Co., 2831 Prospect Ave., Cleveland, Ohio. (Adapters).
Wilkens Mfg. Co., 52 Orawaupun St., White Plains, N. Y.

RADIUM POWDER AND PAINT

Radium Dial Co., 3332 Forbes, Pittsburgh, Pa.
Undark. See United States Radium Corp.
United States Radium Corp., 535 Pearl, New York, N. Y.
RANGE SWITCHES, Rotary Snap. See Switches, Snap, Heavy Duty.
RAWHIDE GEARS. See Gears & Pinions, Rawhide.
READING LAMP BASES. See Bases, Reading Lamp.
REAMERS, Pipe. See Stocks, Dies and Reamers.
RECEPTACLES, Lamp. See Sockets and Receptacles.

RECEPTACLES, Plug, Heavy Duty

	KEY
Battery Charging	See B
Floor Boxes	See F
Welding	See W
Machine Tool	See W
Watertight, Marine, Mine	See M
Car Trailer Connection	See C
Extension	See E

A. B. C. See Anderson Mfg. Co.
Adam Electric Co., Frank, St. Louis, Mo. F
Adapti Co., 2996 E. 72nd, Cleveland, O.. F
Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass. B W M C E
Appleton Elec. Co., 1703 Wellington Ave., Chicago, Ill. M
Arktite. See Crouse-Hinds Co.
Arnessen Electric Co., 13 Water, New York M
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.. F B W
Auth Electrical Specialty Co., 422 E. 53rd, New York, N. Y. E
Benjamin Elec. Mfg. Co., Des Plaines, Ill. F W M
Bryant Elec. Co., Bridgeport, Conn. (Also Range Type.) W
Campbell. See Steel City Elec. Co.
Cannon Elec. Development Co., 420 West Ave., 33, Los Angeles, Cal. F
C. E. M. Co. See Conn. Elec. Mfg. Co.
C. H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. M
Conduletto. See Crouse-Hinds Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn. F
Cory & Son, Chas., 183 Varick, New York M
Crouse-Hinds Co., Syracuse N. Y. B W
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. F
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa. C
Elwell Parker Elec. Co., 4222 St. Clair Ave., N. E., Cleveland, O. B
Fielding. See Stanley & Patterson.
Fountain's See Jenkins Mfg. Co.
Fullman Mfg. Co., Latrobe, Pa. F
Fullman. See Steel City Elec. Co.
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. B
Gleason & Co., J. L., 241 Franklin, Boston, Mass E
H. & H. See Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. B W
Hessel Co., W. F., 76 Greenwich, New York, N. Y. W M E
Hubbell, Inc., Harvey, Bridgeport, Conn. (Also Range Type.) B W
Indestructible. See Kliegl Bros. Universal.
Jenkins Mfg. Co., Bloomfield, N. J. E
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. F B W M
Latrobe. See Fullman Mfg. Co.
Loeffelholz & Co., Milwaukee, Wis. C
Major Equipment Co., 4603 Fullerton Ave., Chicago, Ill. M
Neco. See Novelty Elec. Co.
NePage McKenny Co., Armour Bldg., Seattle, Wash. F
Novelty Elec. Co., Tenth & Cherry Sts., Philadelphia, Pa. C
Ohio Elec. & Controller Co., 5905 Maurice Ave., Cleveland, Ohio W
Ostrander Elecl. Works, W. R., 911 Atlantic Ave., Brooklyn, N. Y.
Preset. See Walker Bros. Co.
Pyle National Co., 1334 N. Kostner Ave., Chicago, Ill. W M C E
Quadrangle Mfg. Co., 30 S. Peoria, Chicago, Ill. (Combination wall bracket and convenience outlet.)
Raleo Mfg. Co., 123 N. Albany Ave., Chicago, Ill.
Russell & Stoll Co., 53 Rose, New York F B W M E
Square D. Co., Detroit, Mich. W
Stanley & Patterson, 150 Varick, New York, N. Y. F
Steel City Elec. Co., Pittsburgh, Pa.. F E
Thomas & Betts Co., 15 Park Place, New York, N. Y. F
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa. M
Walker Bros., 1417 Sansom, Philadelphia F E
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. F B W M
Yale. See Electric Products Co.
RECORDERS, Elapsed Time. See Indicators, Operation.
REDUCERS, Socket. See Socket Reducers.
REFLECTOR LENSES. See Lenses.

REFLECTORS, Porcelain Enameled, Steel

Bolite Reflector Co., 7500 Sherman Ave., Cleveland, O.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Cello, Inc., 96 Prince, New York, N. Y.
Dunlap Co., John, Carnegie, Pa.
Durex. See Wheeler Reflector Co.
Federal Electric Co., 8700 S. State, Chicago, Ill.
Goodlites. See Goodrich Elec. Co.
Goodrich Elec. Co., 1650 Ogden Ave., Chicago, Ill.
Isolux. See Wheeler Reflector Co.
Ivanhoe Division of Miller Co., Cleveland.
Marbelite Art Products Co., 140 N. Robey, Chicago, Ill.
Monk, H. E., 18 Warren, New York, N. Y.
Multi Elecl. Mfg. Co., 210 N. Ogden Ave., Chicago, Ill.
Oamed. See Overbaugh & Ayers.
Overbaugh & Ayers, 411 S. Clinton, Chicago, Ill.
Para Steel. See Wheeler Reflector Co.
Perfection. See Tindall & White.
Philadelphia Elec'l & Mfg. Co., 1228 N. 31st, Philadelphia.
Quad. See Quadrangle Mfg. Co.
Quadrangle Mfg. Co., 30 S. Peoria, Chicago Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Sturdox. See Benjamin Elec. Mfg. Co.
Tindall & White, 33 W. 60th, New York, N. Y.
Vaporlux. See Wheeler Reflector Co.
Westinghouse Elec. & Mfg. Co., South Bend, Ind.
Wheeler Reflector Co., 275 Congress, Boston, Mass.
REFRIGERANTS. See Chemicals, Refrigeration.
REFRIGERATION CHEMICALS. See Chemicals, Refrigeration.

REFRIGERATOR CABINETS

Airtite. See Rhinelander Refrigerator Co.
Alaska Refrigerator Co., Muskegon, Mich.
Allen Filter Co., 25 S. St. Clair, Toledo, O. (Water Cooler Unit.)
American Refrigerator Corp., Peru, Ind.
Argus Products Co., 174 E. Water, Portland, Ore.
Arlington Refrigerator Co., Arlington, Vt.
Athermos. See Gurney Refrigerator Co.
Baldwin Refrigerator Co., Burlington, Vt.
Banta Refrigerator Co., Clearfield, Pa.
Belding-Hall Electrice Corp., Belding, Mich
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bohn Refrigerator Co., St. Paul, Minn.
Castle Double-Servis. See Home Products Corp.
Cavalier. See Tennessee Furniture Co.
Challenge Refrigerator Co., Grand Haven, Mich.
Champion Refrigerator Co., 206 Lexington Ave., New York,
Crystal Refrigerator Co., Fremont, Neb.
Crysteel. See Benjamin Elec. Mfg. Co.
Dry-Air. See Baldwin Refrigerator Co.
Dry-Cold. See Hill & Co.
Economic. See Leonard Refrigerator Co.
Eddy & Sons Co., D., 336 Adams, Boston, Mass.
Erie Art Metal Co. & Erie Metal Furniture Co., Erie, Pa.
General Necessities Corp., General Necessities Bldg., Detroit, Mich.
Gibson Refrigerator Co., Greenville, Mich.
Gloekler Co., Bernard, 1627 Penn Ave., Pittsburgh, Pa.
Gurney Refrigerator Co., Fond du Lac, Wis.
Harder Refrigerator Corp., Cobleskill, N. Y.
Haskelite Mfg. Co., 120 S. La Salle, Chicago, Ill. (Knockdown.)
Heintz Mfg. Co., Front & Olney Aves., Philadelphia, Pa.
Heinz & Munschauer, Superior and Randall, Buffalo, N. Y.
Herrick Refrigerator Co., 1805 River, Waterloo, Iowa.
Hibbard Cabinets, Inc., 6504 Euclid Ave., Cleveland, O.
Hill & Co., C. V., 360 Pennington Ave., Trenton, N. J.
Holderle Bros., Inc., 339 Exchange, Rochester, N. Y.
Home Products Corp., Jackson, Mich.
Howe Scale Co., Rutland, Vt.
Jewett Refrigerator Co., Buffalo, N. Y.
Kingston. See Lorillard Refrigerator Co.
Kleen Kold. See Harder Refrigerator Corp.
Knox Products Co., Fourth & Greenhill Ave., Wilmington, Del.
Knox. See Erie Art Metal Co.
Leonard Refrigerator Co., Div. of Electric Refrigeration Corp., Grand Rapids, Mich.
Liver & Co., C. B., Omaha, Neb.
Loeber Co., Henry G., 151 E. 126th, New York, N. Y. (Ice Cream Cabinet.)
Lorillard Refrigerator Co., 44 Cooper Square, New York.
Louisville Refrigerator Corp., 4460 Louisville Ave., Louisville, Ky.
Louisville Tin & Stove Co., Louisville, Ky.
Mace & Co., L. H., 55 E. 150th, New York, N. Y.
Maine Mfg. Co., Nashua, N. H.
McCray Refrigerator Sales Corp., 2364 Lake St., Kendallville, Ind.
Mowatt Refrigerator Co., 25 Oak Grove, San Francisco, Cal.

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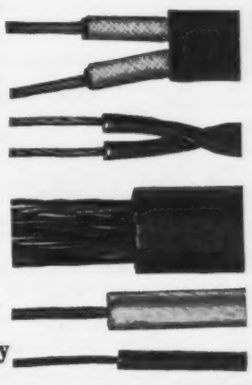

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Reol. See Ottenheimer Bros.
Reolite. See Ottenheimer Bros.
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Rexdale. See Rex Mfg. Co.
Rhinelander Refrigerator Co., Rhinelander, Wis.
Saco-Lowell Shops, Newton Upper Falls, Mass.
Sanitary Refrigerator Co., Fond du Lac, Wis.
Schmidt Co., C., John and Livingston, Cincinnati, O.
Seeger Refrigerator Co., St. Paul, Minn.
Sherer-Gillett Co., 601 W. Washington, Chicago, Ill.
Steeprest. See Heintz Mfg. Co.
Success Mfg. Co., Gloucester, Mass.
Tennessee Furniture Co., Chattanooga, Tenn.
Vogt. See General Necessities Corp.
Ward Refrigerator Co., 6901 S. Alameda, Los Angeles, Cal.
White Mountain. See Maine Mfg. Co.
White Seal. See Louisville Refrigerator Co.
REFRIGERATOR CONDENSER UNITS. See Condenser Units, Refrigerator.

REFRIGERATOR FITTINGS
Commonwealth Brass Corp., 5781 Commonwealth Ave., Detroit, Mich.

REGULATORS, Temperature
American Radiator Co., 1807 Elmwood Ave., Buffalo, N. Y. (Mercury Switch Type.)
American Telethern Co., 1017 Summit, Toledo, O.
American Thermostat Co., 226 Jelliff Ave., Newark, N. J.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa. (Furnace.)
Automatic Reclosing Circuit Breaker Co., Columbus, O.
Basel Mfg. Co., 911 Mulberry, Kansas City, Mo.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Ceaco. See Cobb Electric Appliance Co.
Cobb Electric Appliance Co., 100 Massachusetts Ave., Boston.
Cook Elec. Co., 2700 Southport Ave., Chicago, Ill.
Davis & Daggett Co., 238 Dwight, Springfield, Mass.
D. & T. Manufacturing Co., 3001 La Salle, St. Louis, Mo.
Electric Automatic Appliance Co., Denver, Col.
Engelhart, Chas., 90 Chestnut, Newark, N. J.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Fireside. See Quincy Stove Mfg. Co.
Gifford Heat Control Systems, 1 Broadway, New York.
Gold Car Htg. & Ltg. Co., 220 36th, Brooklyn, N. Y.
Hart Mfg. Co., Hartford, Conn.
Hermansen Elecl. Co., 505 W. 41st, New York, N. Y.
Hynes & Cox Elec. Corp., 406 N. Pearl, Albany, N. Y.
Jewell Mfg. Co., Auburn, N. Y.
Johnson Service Co., 149 Michigan, Milwaukee, Wis.
Lockswitch. See Time-O-Stat Controls Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill. (Mercury Switch.)
Minneapolis-Honeywell Regulator Co., 2753 Fourth Ave., Minneapolis, Minn.
Penn Heat Control Corp., 1207 Race, Philadelphia, Pa.
Powers Regulator Co., 2720 Greenview Ave., Chicago, Ill.
Protectostat. See Minneapolis-Honeywell Reflector Regulator Co.
Quincy Stove Mfg. Co., Quincy, Ill.
Ranco. See Automatic Reclosing Circuit Breaker Co.
Savultime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Sheer Co., H. M., Quincy, Ill.
Simplex Heat Regulator, 2938 Pillsbury Ave., Minneapolis.
Snapon. See Tagliabue Mfg. Co.
Souder-Hornsby Co., Tamaqua, Pa.
Sure Fire. See Boston Machine Wks.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Time-O-Stat Controls Co., Cramblet Engineering Div., 286 Milwaukee Ave., Milwaukee, Wis.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Webster Elec. Co., Racine, Wis.
Wilcolator Co., 17 Nevada St., Newark, N. J.
Wilson-Maulin Co., 383 Concord Ave., New York, N. Y.

RELAYS
(See also Circuit Breakers and Thermostats)
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Schenectady, N. Y.
Roller-Smith Co., 239 Broadway, New York, N. Y.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
Struthers Dunn, Inc., 1133 Race, Philadelphia, Pa.
Wilcolator Co., 17 Nevada, Newark, N. J.
REMOTE CONTROL SWITCHES. See Switches, Remote Control.

REMOVERS, Coil
Ewing Mfg. Company, Middleport, Ohio.

RESISTANCE
Boxes. See Instruments, Laboratory Standard
Coil Cores. See Cores, Resistance.
Test Sets. See Instruments.
Units, Radio. See Radio Circuit Components.
Units. See Units, Rods & Grids.
Wire. See Wire Bare.

RESISTORS
Lautz Mfg. Co., 245 N. J. R.R. Ave., Newark, N. J.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ward-Leonard Electric Co., Mount Vernon, N. Y.
RESISTORS. See Units, Rods & Grids.
REVOLUTION COUNTERS. See Tachometers.
RHEOSTATS.
Motor-Controlling. See Controllers, also Rheostats.
Radio. See Radio Receiver Parts.
Sewing Machine. See Controllers.

RHEOSTATS

	KEY
Battery Charging	See B
Stage Dimming	See D
Meter Testing (Laboratory)	See L
Plating Tank	See P
Motion Pictures (Projector Lamp)	See M
Motor Starting, Field and Speed Regulating	See F

F B D P M L

SCREW MACHINE PRODUCTS AND SPRINGS
for every purpose
WILLIAM STEINEN & COMPANY
297 Washington St. Newark, N. J.

Screw Machine Products
UP TO 2¼ in. DIAMETER
OLSON MFG. CO.
56 Commerical St.
WORCESTER, MASS.

Allen-Bradley Co., 494 Reed, Milwaukee L
Biddle, James G., 1211 Arch, Philadelphia L
Brach Mfg. Corp., L. S., Newark, N. J. (Radio Battery Control.) . . . . . B . . . . . .
Bradleystat. See Allen-Bradley Co.
Columbia Electric Mfg. Co., 1292 E. 52nd, Cleveland, O. . . . . B L
Controlite. See Ward Leonard Elec. Co.
Crown Rheostat & Supply Co., 1910 Park Ave., West Chicago, Ill. . . . . P . . .
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis. . . . . F B D . . . L
Economic Rheostat Switch Co., 3551 N. 5th, Philadelphia, Pa. . . . . F . . . . . .
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland, O. . . . . F . . . . . .
Electric Products Co., 1725 Clarkstone Rd., Cleveland, O. . . . . B . . . . . .
General Electric Co., Schenectady, N. Y. F L
Hanson-Van Winkle-Munning Co., Matawan, N. J. . . . . P . . .
Holzmuller, C. J., 1108 Howard, San Francisco, Cal. . . . . D . . . . .
Kliegl Bros. Universal Elec. Stage Lighting Co., 321 W. 50th, New York, N. Y. . . . D . . M . .
Knoeller Elec. Co., De Pere, Wis. . . . . F . . . . . .
National Elec. Controller Co., 5315 Ravenswood Ave., Chicago . . . . . F B D . . M L
Optimus. See Hanson-Van Winkle-Munning Co.
Robertson, Leo F., 536 W. 22nd, New York, N. Y. . . . . M . .
Rubicon Co., 29 W. Sixth, Philadelphia, Pa. L
Schaefer Bros. Co., 1059 W. 11th, Chicago . . B . . . . . .
Simplicity. See Cutler-Hammer Mfg. Co.
Union Elec. Mfg. Co., Milwaukee, Wis. . . F . . . . . .
Universal. See Ward Leonard Elec. Co.
Vitrohm. See Ward Leonard Elec. Co.
Ward Leonard Elec. Co., Mt. Vernon, N. Y. . . . . F . . D . . M . .
Watton. See Electric Products Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. . . . . F . . . . . M . .
RINGS Seal. See Packing.

RIVETS
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Rivet & Specialty Co., 1836 S. 54th, Chicago, Ill.
Hassall, Inc., John, 402 Oakland, Brooklyn, N. Y.
Hungerford Brass & Copper Co., Div. of The Chase Brass Companies, Inc., 88 Lafayette, New York, N. Y.
Manufacturers Belt Hook Co., 1315 W. Congress, Chicago, Ill.
Merwin Mfg. Co., Bridgeport, Conn. (Solid & Tubular).
Nelson Rivet Co., Taunton, Mass.
Stimpson Co., Edwin B., 70 Franklin Ave., Brooklyn, N. Y.
Thomson Mfg. Co., Judson L., Waltham, Mass.
Tubular Rivet & Stud Co., 87 Lincoln, Boston, Mass.
Waterbury Brass Goods Co., Waterbury, Conn.
Wright & Corson Mfg. Co., Bridgeport, Conn.
RODS, Resistance. See Units, Rods and Grids.
ROLLER BEARINGS. See Bearings, Ball and Roller.

ROLLS, Coil Flattening
Columbia Machine Tool Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
RUBBER BELTS. See Belts, Rubber.

RUBBER, Hard
Hard Rubber, Ebonite, Vulcanite.
Aetna Rubber Co., 815 E. 79th, Cleveland, O.
American Hard Rubber Co., 11 Mercer, New York, N. Y.
Connecticut Hard Rubber Co., West Haven, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Luzerne Rubber Co., Murhead, near Dewey, Trenton, N. J.
Mahoganite. See American Hard Rubber Co.
New York Hard Rubber Turning Co., 212 Centre, New York.
Panelyte Corp., Trenton, N. J.
Radiolite. See Superior Hard Rubber Co.
Stokes Rubber Co., Trenton, N. J.
Superior Hard Rubber Co., Butler, N. J.
U. S. Rubber Co., 1790 Broadway, New York, N. Y.
Vulcanized Rubber Co., 251 4th Ave., New York, N. Y.
Vulco Panels. See Vulcanized Rubber Co.

RUBBER, MECHANICAL GOODS
Goodrich Rubber Co., B. F., Akron, O.
Republic Rubber Co., Youngstown, O.
Sun Rubber Co., Barberton, O.
RUBBER, SEMI-HARD. See Rubber Mechanical Goods.

RUBBER, Sponge
Sun Rubber Co., Barberton, O.
Toycraft Rubber Co., Ashland, O.
RUBBER TAPE. See Tape, Rubber and Friction.
RUBBER TUBING. See Tubing, Rubber.
RUST PROOFING. See Plating & Finishing.
SAL AMMONIAC. See Chemicals, Battery.
SALTS, Battery. See Chemicals, Battery.
SATURATING TANKS. See Wire Manufacturing Machines
SCREW SHELLS, Socket. See Shells, Screw Socket.

SCREW DRIVING MACHINES
Vim Electric Tool Co., 149 Broadway, New York, N. Y.

SCREW MACHINE PRODUCTS
Aluminum Co. of America, 2444 Oliver Bldg., Pittsburgh, Pa.
Barnes Co., Wallace, Bristol, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Brighton Screw & Mfg. Co., 1456 Harrison Ave., Cincinnati, O.
Celoron Co., Bridgeport, Pa.
Chapman Machine Co., Terryville, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Colonial-Premier Co., 225 W. Ohio, Chicago, Ill.

Eureka Tool & Machine Co., Newark, N. J.
Farries Mfg. Co., Decatur, Ill.
Hanson, Elnar B., 17 Hermon, Worcester, Mass.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Indianapolis Screw Products Co., 621 N. Noble, Indianapolis,
Linden & Co., 891 Broad, Providence, R. I.
Meisel Press Mfg. Co., 944 Dorchester Ave., Boston, Mass.
Olsen Mfg. Co., 56 Commercial, Worcester, Mass.
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Shimer & Sons, Samuel J., Milton, Pa.
Steiner & Co., 297 Washington, Newark, N. J.
Thomaston Mfg. Co., Thomaston, Conn.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Wilmington Fibre Specialty Co., Wilmington, Del.

SCREWS, Cap (Cut Thread)
Bristol Co., Waterbury, Conn.
Hartford Machine Screw Co., Hartford, Conn.

SCREWS, Drive
Parker-Kalon Corp., 190 Varick, New York, N. Y.

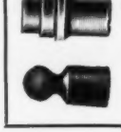
SCREWS, Machine
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Clark Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Hubbell, Inc., Harvey, Bridgeport, Conn.
New England Screw Co., Dept. A, 44 Farnsworth, Boston,
Pheoll Mfg. Co., 5700 Roosevelt Rd., Chicago, Ill.
Progressive Mfg. Co., Torrington, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Strong, Carlisle & Hammond, 1392 W. Third, Cleveland, O.

SCREWS, Machine (Cut Thread)
American Screw Co., Providence, R. I.
SECOHMMETERS. See Instruments, Laboratory Standard.
SEGMENTS. See Discs, Armature.

SEPARATORS, Storage Battery
Baltimore Battery Separator Co., Baltimore, Md.
Campbell Elec. Co., Kansas City, Mo.
Carille & Doughty, 2530 N. Broad, Philadelphia, Pa.
Chattanooga Battery Box Co., Chattanooga, Tenn.
Certified. See Ermet Products Co.
Consumers Rubber Co., 1302 Ontario, Cleveland, O.
Ermet Products Co., Sherman Drive & 16th, Indianapolis, Ind. (Wood.)
Estes & Sons, E. B., 25 Vanderbilt Ave., New York. (Wood.)
Indianapolis Box & Separator Co., 1450 E. 19th St., Indianapolis, Ind. (Wood.)
Indianapolis Mfg. Co., Indianapolis, Ind.
Inseco. See Indianapolis Box & Separator Co.
Link & Hemrick, Inc., 535 W. 52nd, New York, N. Y.
Red Band. See Indianapolis Mfg. Co.
Stewart Mfg. Co., Wm. E., 14th & Elm, Flint, Mich. (Wood.)
Wick Lumber Co., R., 539 W. 52nd, New York. (Wood.)

SHADES
Aluminum. See Shades, Metallic.
Asbestos. See Shades, Fabric.
Bamboo. See Shades, Fabric.
Brass. See Shades, Metallic.
Cast Metal. See Shades and Domes.
Copper. See Shades Metallic.
Cretonne. See Shades, Fabric.
Leaded. See Shades and Domes.
Leather. See Shades, Fabric.
Linen. See Shades, Fabric.
Mica. See Shades, Mica.
Molded. See Molded Insulation.
Mosaic. See Shades and Domes.
Paper. See Shades, Fabric.
Parchment. See Shades, Fabric.
Silk. See Shades, Fabric.
Stamped Metal. See Shades, Metallic; also Shades and Domes.
Steel. See Shades, Metallic.
Tin. See Shades, Metallic.
Zinc. See Shades, Metallic.

SHADES, Fabric
Asbestos Cretonne, Leather, Linen, Paper, Silk, Bamboo, Parchment.
Acme Lamp Shade Co., 630 W. Madison, Chicago. (Silk.)
Adelphi Lamp Shade Co., 242 Fifth Ave., New York. (Silk.)
Admiration Lamp Shade Co., 160 Madison Ave., New York, N. Y. (Silk.)
Andrews Co., C. M., 32 E. 30th, New York, N. Y. (Silk.)
Art Lamp Shade Studios, 316 Fifth Ave., New York, N. Y.
Audrey Art Shade Studios, 105 Thatford Ave., Brooklyn.
Block & Co., L. D., 37 E. 18th St., New York, N. Y.
Borghese. See Hall, Chas.
Daiger Co., Charles V., 76 Essex, Boston, Mass. (Silk.)
Eastern Art Shop, 14 W. 19th, New York. (Parchment.)
Foss Parchment Shade Studio, 1338 E. 12th, Oakland, Cal. (Parchment.)
Foslite. See Foss Parchment Shade Studio.
Frostelene. See Art Lamp Shade Studios.
Gibson Art Co., 223 W. Fourth, Cincinnati, Ohio. (Paper.)
Hall, Chas., 3 E. 40th, New York, N. Y. (Paper Parchment.)
Hanson Co., Paul, 15 E. 26th, New York, N. Y. (Chints.)
Harris Mfg. Co., 122 University Place, New York, N. Y. (Parchment.)
Herco Art Mfg. Co., Meriden, Conn.
Hoft Studio, 46 W. 21st, New York, N. Y. (Parchment.)
Idealite Elec. Lamp Shade Mfg. Co., 7 E. 17th, New York, N. Y. (Parchment.)
Kapa Shell. See Wardwell, E. H.
Kerwin. See Hall, Chas.
Kno-Glair. See Hamilton, M. E.
Lamb Bros. & Greene Corp., Napannee, Ind. (Silk.)
Luxrite. See John H. St. John.
Maxwell-Ray Co., Milwaukee, Wis. (Silk.)
Monarch Lamp & Shade Co., 210 N. Second, Philadelphia, Pa. (Silk.)
Morimura Bros., 58 W. 23rd, New York. (Bamboo, Silk, Cretonne.)
Parchment Novelty Co., 87 E. 10th, New York, N. Y. (Parchment.)
Patent Lamp Shade Co., 1361 Frankford Ave., Philadelphia.
Peerless Lamp Shade Mfg. Co., 114 E. 25th, N. Y. (Silk.)
R. D. Electric Co., Fort Wayne, Ind. (Linen and Silk.)
Reuter, Wm., 32 W. 34th, New York, N. Y. (Silk.)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Send us your specifications for an estimate.
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If there was a distinguished service medal in industry

Brawley felt feet

would get it!

Look for the name stamped on every piece

After long experimenting, we succeeded in perfecting a process whereby high-grade felt feet could be made practically indestructible, and still kept low in price. Brawley Felt Feet proved to be a boon to manufacturers of fine radio cabinets, battery eliminators, etc., which required a permanent protection against vibration and scratching.

We did not realize how indestructible they were, however, until Thomas A. Edison, Inc., tested them for use on the Ediphone. As shown in the illustration above, a Brawley felt foot, held in a bench vise, was attacked with 10 inch pliers. Tiny pieces could be slowly torn off, but the foot remained **serviceable** after an exhaustive test! They were approved, of course.

Other electrical manufacturers who value permanent protection for their products are seeing the great advantage of Brawley Felt Feet. Reliability in such essentials builds public confidence in their products.

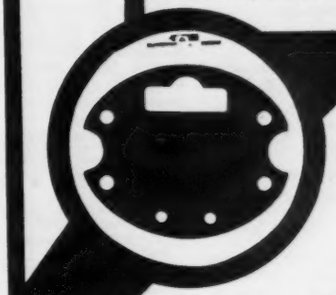
Brawley Felt Feet are made with machine or wood screws and nails. Write for full information.

Immediate shipment on all standard goods, and prompt attention given to special felt problems.

T. R. BRAWLEY

279 20th St., Brooklyn, N. Y.

1. Frame of mechanism is held securely in top and bottom discs.
2. Lines point to upper and lower discs made of Fibroc Material.



LIGHTS or NO LIGHTS

THE actual size punched FIBROC insulator is a very small part of the assembly of Levolier switches, made by the McGill Manufacturing Company, yet it is a very vital part of the assembly.

Failure to do its job well means the difference between LIGHTS or NO LIGHTS.

The manufacturer of this switch selected FIBROC ONLY after careful tests—FIBROC won its place solely on merit—and is holding that place on the same basis.

FIBROC Punched parts for all kinds of insulation work are accurate, clean-edged, and assemble quickly and easily. There are no culls, no seconds. An exceedingly rigid inspection department guarantees that only perfect parts are delivered.

It will pay you to consider FIBROC punched parts, for insulation in your products.

FIBROC

FIBROC INSULATION CO.

245 Lincoln Avenue

VALPARAISO, INDIANA

SHADES, Fabric—Continued
Kindsvatter Mfg. Corp., 22 E. 24th, Chicago, Ill.
Rosita Studio, 10 W. 28th, New York, N. Y. (Parchment and Leatherette.)
Sanderson's Art Co., Milwaukee, Wis. (Parchment.)
Springel & Son, A., 26 S. 3rd, Philadelphia, Pa.
St. John, John H., 1298 Atlantic Ave., Brooklyn, N. Y. (Silk.)
Straus-Hohenstein Co., 133 W. 21st, New York. (Silk.)
Superior Lamp Shade Manufacturers, 72 Madison Ave., New York, N. Y. (Silk.)
Tapestrelle Corp., 44 E. 29th, New York, N. Y.
Tombs Studios, Wm. H., 172 Pennsylvania Ave., Newark, N. J. (Parchment Paper.)
Trio Mfg. Co., 610 N. American, Philadelphia, Pa. (Silk.)
Troy Art Studio, 624 2d Ave., Troy, N. Y.
Utility Shade Co., Tenafly, N. J.
Vogue Lamp & Shade Co., 130 W. 17th, New York, N. Y. (Parchment.)
Volkman Co., 3223 W. Lake, Chicago, Ill.
Wardwell, E. H., 11 E. 36th, New York, N. Y.

SHADES AND DOMES

Leaded, Mosaic or Figured, Stamped or Cast Metal.
Art Shade Co., 223 N. Desplaines, Chicago, Ill.
Badanes Mfg. Co., 62 Greene, New York, N. Y.
Bayley & Sons, 105 Vanderveer, Brooklyn, N. Y.
Mutual Sunset Lamp Co., 21 E. Houston, New York, N. Y.
Royal Art Glass Co., 2572 Park Ave., New York, N. Y.
Western Art Glass Shade Works, 101 Turk, San Francisco.

SHADES, FACTORY WINDOW. See Window Shades, Factory.

SHADES, Metallic

Tin, Aluminum, Brass, Copper, Zinc, Steel.
A. A. Elec. Mfg. Co., Bridgeport, Conn. (Sole selling agent, Harry Pickhardt, 129 W. 15th, New York, N. Y.)
Durex. See Wheeler Reflector Co.
Farles Mfg. Co., Decatur, Ill. (Brass, Aluminum, Tin, Copper.)
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. (Aluminum, Brass, Zinc, Iron, Steel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Aluminum, Brass, Steel, Tin.)
Miller Co., Meriden, Conn.
Monk, H. E., 18 Warren, New York, N. Y. (Tin, Aluminum, Brass, Copper, Zinc & Steel).
Oamco. See Overbaugh & Ayres Mfg. Co.
Overbaugh & Ayres Mfg. Co., 411 S. Clinton, Chicago, Ill.
Richardson Reflector Co., 16 Hudson, New York, N. Y.
Western Reflector Co., 1221 W. Madison, Chicago. (Tin.)
Wheeler Reflector Co., 275 Congress, Boston, Mass.

SHADES, Mica

Hirsch Mica Co., 1087 Flushing Ave., Brooklyn, N. Y.
Huse-Liberty Mica Co., 73 Long Wharf, Boston, Mass.
Kant-Krack. See Huse Liberty Mica Co.
Mica Insulator Co., 200 Varick, New York, N. Y.
Storrs Mica Co., 11 Park Place, New York, N. Y.
Tar Heel Mica Co., Plumtree, N. C.
Tarmilite. See Tar Heel Mica Co.

SHAFT COUPLINGS. See Couplings, Shaft.
SHAFTS, Flexible. See Tubing, Flexible Metallic.

SHAPING MACHINES, Coil

Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.

SHEARS, Insulation

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

SHEET STEEL CABINETS. See Cabinets, Sheet Steel.

SHELLS, Screw Socket

Chase Brass & Copper Co., Waterbury, Conn.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
Patton-MacGuyer Co., Providence, R. I.
Rixdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Torrington Mfg. Co., 70 Franklin, Torrington, Conn.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., 800 S. Main, Waterbury, Conn. (Miniature.)

SHUNTS, Instruments. See Instruments, Laboratory Stand and.
SIGN FLASHERS. See Flashers, Sign.
SIGN LETTER LENSES. See Lenses.

SILICA

Ottawa Silica Co., Ottawa, Ill. "Flint Shot."

SILK, Cloth Insulated. See Cloth & Paper.
Shades. See Shades, Fabric.
Tape. See Tape.
Thread. See Yarn, etc.

SILVER, Metal and Wire

Baker & Co., Inc., 54 Austin, Newark, N. J.
Handy & Harman, 57 William, New York, N. Y.
Wilco. See Wilson Co., H. A.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SILVER SOLDER. See Solder, Silver.
SINE WAVE OSCILLATORS. See Instruments, Laboratory Standard.
SKINNERS WIRE. See Scrapers.
SLABS, Switchboard. See Asbestos Slabs; also Molded Insulation, Slate; Soapstone.

SLATE

For Switchboard Slabs and Barriers.
Davis Slate & Mfg. Co., 618 E. 40th, Chicago, Ill.
Electrical Specialties Corp., 50 Pearl, Boston, Mass.
Fair Haven Marble & Marbleized Slate Co., Fair Haven, Vt.
Penrhyn Slate Co., Hydeville, Vt.
Portland-Munson Slate Co., Portland, Me.
Structural Slate Co., Pen Argyl, Pa.

SLEEVE-BEARINGS. See Bearings and Bushings
SLEEVING, Cotton. See Tape, Cotton.
SLOTTING FILES. See Files, Commutator Slotting.

SLOTTING MACHINES and TOOLS, Commutator

(Mica Undercutters).
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
General Electric Co., Schenectady, N. Y.
Hobart Bros. Co., Troy, Ohio.
Hullhorst Micro Tool Co., 3240 E. Monroe, Toledo, O.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Martindale Electric Co., 1255 W. Fourth, Cleveland, Ohio.

Fair Haven Marble & Marbleized Slate Co. SLATE
Fair Haven Vermont GOODS

PORTLAND-MONSON SLATE CO.

PORTLAND-MONSON SLATE CO. TRADE MARK PORTLAND, ME.

Quarriers of
Monson Slate
for Electrical
Purposes, Natural
Black, Oil Finish
Quarries:
Monson, Maine
Office, Portland, Maine

Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ransom & Randolph Co., Superior & Chestnut, Toledo, Ohio
Simplex. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
White Dental Mfg. Co., S. S., 152 W. 42nd, New York.

SNAP SWITCHES. See Switches, Snap

SOAPSTONE

For Switchboard Slabs and Barriers.
Alberene Stone Co., 153 W. 23rd, New York, N. Y.
Lin-Stun. See Westinghouse.
Soapstone Products Co., 97 Warren, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SOCKET LININGS. See Linings, Socket
SOCKET SHELLS. See Shells, Screw Socket.
SOCKETS, Flashing. See Flashers, Sign.

SOCKET Chain and Attachments

Pull Chain, Chain Links, Chain Adjusters, Acorns, Extensions, Insulation Chain Splicers.
Abbott. See Harvey Hubbell, Inc.
American Brass Co., 25 Broadway, New York, N. Y. (Acorns.)
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Bryant Electric Co., Bridgeport, Conn.
Duplex. See Warner Bros. Co.
Eade, John E., 104 Point, Providence, R. I. Links, Insulators.
Easylite. See Rittenhouse Co., A. E.
Economy. See Harvey Hubbell, Inc.
Flory, Wm. E., 38 W. 32nd, New York, N. Y. (Decorative Pull Chains.)
Gripper. See Wittenberg Bros.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. (Metal Pull Tassel.)
Hubbell, Inc., Harvey, Bridgeport, Conn. (Links and Acorns. Metal Pull Tassels.)
Paiste. See Hart & Hegeman Mfg. Co.
Pass & Seymour, Inc., Solvay Sta., Syracuse, N. Y. (Pull Chain Tassel.)
P. & S. See Pass & Seymour, Inc.
Rittenhouse Co., A. E., Honeoye Falls, N. Y. (Sole Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Royal. See Sears, Henry D.
Scovil Mfg. Co., Waterbury, Conn. (Acorn.)
Sears, Henry D., 50 Boylston, Boston, Mass.
Weber. See Sears, Henry D.
Wittenberg Bros., 60 Shipman, Newark, N. J. Links, Insu-

SOCKET REDUCERS

Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Benjamin Elec. Mfg. Co., Des Plaines, Ill.
Can-del-lite. See Sears, Henry D.
Eagle Electric Mfg. Co., 59 Hall, New York, N. Y.
Electric Co., 94 Allyn, Hartford, Conn.
General Electric Co., Merchandise Dept., Section W-234 Bridgeport, Conn.
Hart & Hegaman Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn.
Morse Co., Frank W., 291 Congress, Boston, Mass.
Pass & Seymour, Solvay Sta., Syracuse, N. Y.
Propp Co., M., 524 Broadway, New York, N. Y.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Sears, Henry D., 50 Boylston, Boston, Mass.

SOCKETS, Radio. See Radio Receiver Parts.

SOCKETS AND RECEPTACLES, Lamp

Bases other than Standard (or Medium) are indicated as follows: Mogul, M; Candelabra (or Miniature), C.

Key	See K
Composition	See W
Metal Shell	See B
Porcelain	See A
Pull Chain	See P
Push Through	See T
Sign Receptacles	See A

A. B. C. See Leviton Mfg. Co.
Acme Elec. & Mfg. Co., Canal & Hamilton Ave., Trenton, N. J. ..... A
Ajax Elec. Specialty Co., 1926 Chestnut, St. Louis, Mo. ..... W
Alabax. See Arrow Elec. Co.
Appleton Electric Co., 1730 Wellington Ave., Chicago, Ill. ..... A
Armstrong & White, 9th and Liberty Ave., Pittsburgh, Pa. ..... A
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. M C K T P B A
Arrogrip. See Arrow Elec. Co.
A. & W. See General Outdoor Adv. Co.
Beaver Mfg. Co., 625 N. Third, Newark, N. J. ..... C . . . P B .
Best. See United States Elec. Mfg. Corp.
Bryant Elec. Co., Bridgeport ..... M C K T P B A
C-H. See Cutler-Hammer Mfg. Co.
Circle F Mfg. Co., Trenton, N. J. ..... M . . K T P B A
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn. .....
Connecticut Elec. Mfg. Co., Bridgeport, Conn. ..... M . . K T . . B A
Crouse-Hinds Co., Syracuse, N. Y. ... A W .....
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee, Wis. ..... K T . . B A
Durex. See Wheeler Reflector Co.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y. .....
Economy Fuse & Mfg. Co., 2717 Greenview Ave., Chicago, Ill. ..... P B . .
Far-Go Elec. Mfg. Co., 368 Broome, New York, N. Y. ..... C .....
Federal Electric Co., 8700 S. State, Chicago, Ill. ..... A
Flute. See Pass & Seymour.

Flutelier. See Pass & Seymour.
Frink Co., Inc., 369 Lexington Ave., New York, N. Y. ..... M C . . . . . B . .
Gaynor Elec. Co., Bridgeport, Conn. ..... A
General Elec. Co., Section W-234 Merchandise Dept., Bridgeport, Conn. ... M C K T P B A
Glow Elec. Co., 23 Queens, Long Island City, N. Y. ..... M . . . . . B . .
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn. ..... M C K T P B A
Hoosick Falls Radio & Elec'l Parts Mfg. Co., Hoosick Falls, N. Y. ..... W .....
Hubbell, Inc., Harvey, Bridgeport, Conn. M C K T P B A
H. & H. See Hart & Hegeman.
I-D-A. See Watson Mfg. Co., J. E.
K-E Cleat Receptacle. See Kirkman.
Kirkman Engineering Co., 1 Dominick, New York. (Cleat Receptacle.) .....
Leader. See Leviton Mfg. Co.
Leiser & Co., W. A., 1607 Sansom, Philadelphia, Pa. ..... A
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y. ..... M C K . . P B A
Levolier. See McGill Mfg. Co.
Liberty Bell. See Hart & Hegeman.
Locat-A-Catch. See Connecticut.
McGill Mfg. Co., Valparaiso, Ind. ..... P B A
Majestic Elec. Mfg. Co., 806 N. 12th, St. Louis. (Lamp Receptacle.) ..... A
Molded Socket Corp., Railroad, Pa. ..... K .....
Multi Elec'l Mfg. Co., 1840 W. 14th, Chicago, Ill. ..... A
Multilok. See Circle F Mfg. Co.
Newgard. See Multi Elec'l Mfg. Co.
New Wrinkle. See Bryant Elec.
Noark. See Colt's Patent Fire Arms.
One 4 All. See Propp Co., M.
P. & S. See Pass & Seymour.
Pass & Seymour, Solvay Station, Syracuse, N. Y. ..... M C K T P B A
Paulding, John I., New Bedford, Mass. ..... B A
Perkins. See Bryant Elec. Co.
Porcelain Products, Inc., Findlay, O. ..... A
Propp Co., M., 524 Broadway, New York, N. Y. .....
Quick Catch. See Hubbell, Inc.
Royal. See Sears, Henry D.
Ryan Appliance Co., 117 Mulberry, Trenton, N. J. ..... W ..... A
Safti Soc. See Molded Socket Corp.
Sears, Henry D., 50 Boylston, Boston ... M C K T P B A
Security. See Circle F Mfg. Co.
Shurlock. See Pass & Seymour.
Siemen Co., Bridgeport, Conn. .....
Taplet Mfg. Co., 3709 Pewelton Ave., Philadelphia, Pa. ..... A
Titan. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. ..... A
Union Insul. Co., Parkersburg, W. Va. .....
United States Elec. Mfg. Corp., 222 W. 14th, New York, N. Y. ..... P . . B . . W
U. S. Electric Co., 311 Chambers St., Trenton, N. J. ..... A
Waleo. See Leiser & Co., W. A.
Waterbury Button Co., Waterbury, Conn. .....
Watson Mfg. Co., J. E., 5506 N. Fifth, Philadelphia, Pa. (Concealed Fixture) ..... P B . .
Weber. See Sears, Henry D.
Wheeler Reflector Co., 275 Congress St., Boston, Mass. ..... P . . . .
Wiring Devices, Inc., 5 High, Trenton, N. J. ..... A
Wood Electric Co., C. D., 585 Broadway, New York. (Sign Receptacles.) ..... A
Woodwin. See Wood Elec. Co.
Wrinklet. See Bryant Elec. Co.

SOLDER, Aluminum

Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill.
Aluminum Solder Corp. of America, 730 Fifth Ave., New York, N. Y.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Platt Bros. & Co., Waterbury, Conn.
Solderlume. See Aluminum Solder Corp. of America.
Union Smelting & Refining Co., Newark, N. J.
Usarco. See Union Smelting & Refining Co.

SOLDER, Bar and Wire

Eagle. See Hoyt Metal Co.
Genuine A. See Hoyt Metal Co.
Hoyt Metal Co., St. Louis, Mo.

SOLDER, Self-Fluxing

American Solder & Flux Co., 2910 N. 16th, Philadelphia.
Chicago Solder Co., 4210 Wrightwood Ave., Chicago, Ill.
Dutch-Boy. See National Lead Co.
Gardiner Metal Co., 1366 W. Lake, Chicago, Ill.
Kester. See Chicago Solder Co.
Lenk Mfg. Co., 32 Merrimac, Boston, Mass.
National Lead Co., 111 Broadway, New York, N. Y.
Solderall Co., 129 Sussex Ave., Newark, N. J.
Tinol. See American Solder & Flux Co.

SOLDER, Silver

Handy & Harman, 57 William, New York, N. Y.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

SOLENOIDS. See Coils, Finished.

SOLDERING Compounds. See Soldering Compounds.
Irons. See Soldering Irons.
Machines. See Soldering Machines, Commutator
Tools. See Torches and Furnaces.

SOLDERING COMPOUNDS

Stick Paste, Flux Salts, Fluid.
Allen Co., Inc., L. B., 6750 Bryn Mawr Ave., Chicago, Ill. (Soldering, Stick Paste, Salts, Liquid Oil, Welder, Aluminum Flux, Fountain Brushes.)
American Solder & Flux Co., 2910 N. 16th, Philadelphia, Pa. Flux, Paste, Salts.
Ameo. See American Solder & Flux Co.
Anchor. See Garden City Laboratory.
Benson Co., Alex R., Hudson, N. Y. (Salts and Paste.)
Burnley Battery & Mfg. Co., North East, Pa. Paste and Stick.
Brutner Chemical Wks., 217 E. 3rd, Cincinnati, O.

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SOLDERING COMPOUNDS—Continued
Callahan & Co., Geo., 218 Front, New York. (Fluid.)
Central Stamping Co., 206 Broadway, New York, N. Y. Paste and Salts.
Challenge. See Highland Electro Chemical Co.
Conductalute. See Technical Products Co.
Crescent. See McGill Mfg. Co.
Diamond. See Burnley Battery & Mfg. Co.
Dielectric Mfg. Co., St. Louis, Mo.
Dunton Co., M. W., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Eureka. See Grasselli Chemical Co.
Firth Radio Corp., 25 Beaver, New York, N. Y.
Fluxite. See Monarch Products Co.
Garden City Laboratory, 300 W. Adams, Chicago, Ill.
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. (Paste).
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Highland Electro Chemical Mfg. Co., Connellsville, Pa. (Paste, Stick, Salts.)
Incomparable. See Reade Mfg. Co.
Leveridge, Inc., Chas. W., 246 Fulton, New York, N. Y.
Luco. See Lukens Metal Co.
Lukens Metal Co., T. F., 1105 Fairmount Ave., Philadelphia, Pa.
McGill Mfg. Co., Valparaiso, Ind. Fluid.
Mitchell-Rand Mfg. Co., 19 Vesey, New York. (Paste.)
Monarch Products Co., Red Bank, N. J.
Neutral. See Dielectric Mfg. Co.
New-Idea. See Hartwig Co., Wm. J.
Nokorode. See Dunton Co., M. W.
Oakwood. See Weaver Specialty Co.
Paragon Insulating Co., 5716 Euclid Ave., Cleveland, O.
Perfecto. See Firth Radio Corp.
Pfanstiehl Chemical Co., Waukegan, Ill. Paste, Salts, Sticks, Fluid, Oil, and Solid Sal Ammonica.
Queens. See Brunner Chemical Works.
Reade Mfg. Co., 133 Hoboken Ave., Jersey City, N. J. (Fluids, Salts, Paste).
Redens. See Reade Mfg. Co.
Red-Letter. See Ruby Chemical Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y. (Paste.)
Rotax Mfg. Co., 380 E. 133rd, New York, N. Y.
Ruby Chemical Co., Columbus, O.
Ruby Fluid. See Ruby Chemical Co.
Salbrick. See American Solder & Flux Co.
Silva-Wares, Inc., 134 W. 26th, New York, N. Y.
Snarr & Co., Geo. W., 110 S. Ninth, St. Louis, Mo. (Paste.)
Snowflake. See Grasselli Chemical Co.
Snowflake. See Highland Electro Chemical Co.
Solderine. See Central Stamping Co.
Solderite, Inc., 22 Green, Newark, N. J.
Speco. See Pfanstiehl Chemical Co.
Standard. See Grasselli Chemical Co.
Star. See McGill Mfg. Co
Superior. See Highland Electro Chemical Co.
Technical Products Co., 114 S. Sheridan Sq., Pittsburgh, Pa. (Paste).
Tinol. See American Solder & Flux Co.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago, Ill.
Weaver Specialty Co., 6344 Aurelia, Pittsburgh, Pa.
Yager's. See Benson Co., Alex R.
Yankee. See Leveridge, Inc., Chas. W.

SOLDERING IRONS

Acme Elec. Heating Co., Dept R, 1217 Washington, Boston.
Adroit. See Adrola Corp.
Adrola Corp., Port Jefferson, N. Y.
American Beauty. See American Elecl. Heater Co.
Americal Elecl. Heater Co., Detroit, Mich.
Beardsley & Wolcott Mfg. Co., Waterbury, Conn.
Beckwith Machine Co., Ravenna, Ohio.
Betsy Ross. See Central Flatiron Mfg. Co.
Brach Mfg. Corp., L. S., Newark, N. J.
Burnley Battery & Mfg. Co., North East, Pa.
Central Flatiron Mfg. Co., Johnson City, N. Y.
Chapman Machine Co., Terryville, Conn.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Davis Specialty Works, East Gary, Ind.
Dominion Elec'l Mfg. Co., 712 Ontario Ave., N., Minneapolis.
Dover Mfg. Co., Dover, O.
Drake Elec. Wks., 3943 Lincoln Ave., Chicago, Ill.
Edison Elec. Appliance Co., 5600 W. Taylor, Chicago, Ill
Electrahot Mfg. Co., 525 S. 4th, Minneapolis, Minn.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland (Transformer Soldering Outfit.)
Electric Soldering Iron Co., Inc., 135 W. 17th, New York.
Electrical Products Mfg. Co., Providence, R. I.
Enco. See Electrical Necessities Corp.
Esico. See Electric Soldering Iron Co.
Everhot. See Swartzbaugh Mfg. Co.
Ever-Ready. See Gold Seal Elec. Co.
General Electric Co., Schenectady, N. Y.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Home. See Majestic Elec. Appliance Co.
Illinois Stamping & Mfg. Co., 220 N. Jefferson, Chicago, Ill
Industrial. See Permway Mfg. Co.
Jiffy. See Koch & Co., Paul W.
Junior. See Drake Elec. Wks.
King. See Electric Heat Control Co.
Koch Co., Paul W., 23 S. Wells, Chicago. (Solder Dipper)
Landers, Frary & Clark, New Britain, Conn.
Lenk Mfg. Co., 30 Merrimac, Boston, Mass.
Lotan. See Simplex Flux & Solder Co. of America.
Lucifer. See Jones Point Tool & Elec. Co.
Majestic Electric Appliance Co., San Francisco, Cal.
Manning-Bowman & Co., Meriden, Conn.
Mechanics. See Drake Elec. Wks.
Moto-Ray Mfg. Co., 169 Massachusetts Ave., Boston, Mass
National Specialties Co., Howell & Tyler Sts., Fort Wayne, Ind.
Northern Elec. Co., 2833 N. Western Ave., Chicago, Ill.
Queen Quality. See Watlow Elec. Mfg. Co.
Quick-Hot. See Moto-Ray Mfg. Co.
Radio See Drake Elec. Wks
Regular. See National Specialties Co.
Reliance. See Landers, Frary & Clark.
Samson Cutlery Co., 8 Jones St., Rochester, N. Y.
Security Elec. Mfg. Co., 2633 Canton, Chicago, Ill.
Silver King. See Illinois Stamping & Mfg. Co.
Simplex Flux & Solder Co. of America, 1965 E. 66th, Cleveland, O.
Superior Elec. Products Corp., 1300 S. 13th, St. Louis, Mo.
Swartzbaugh Mfg. Co., 1501 W. Bancroft, Toledo, O.
Torrid. See Beardsley & Wolcott Mfg. Co.
Trent, Harold E., 295 N. Lawrence, Philadelphia, Pa.
Varlek Elec. Mfg. Co., 28 E. 21st St., New York, N. Y.
Vulcan Elec Heating Co., 225 Varick, New York, N. Y.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago, Ill.
Ward Mfg. Co., 937 Wellington Ave., Chicago, Ill.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Wellmade Elec. Co., Torrington, Conn.

SOLDERING MACHINES, Commutator

(For production soldering of small commutators).
Allatonce. See Chapman Electric Works, P. E.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.
SOLENOIDS. See Coils
SOLVENTS & REDUCERS, VARNISH. See Paint, Varnish, Lacquer.
SPAGHETTI. See Tubing, Varnished Fabric.
SPEED CHANGING UNITS. See Gears (Speed Changing Units).
SPEED INDICATORS. See Tachometers.
SPOOLING MACHINES, WIRE. See Wire Manufacturing Machines.

SPRAYING OUTFITS

Airway. See Binks Spray Equip. Co.
Babco. See Simons Paint Spray Brush Co.
Beach Air Brush Co., Willard C., Harrison, N. J.
Binks Spray Equipment Co., 3120 Carroll Ave., Chicago, Ill
De Vilbiss Mfg. Co., 3750 Detroit Ave., Toledo, Ohio.
Eclipse Air Brush Co., 79 Orange, Newark, N. J.
Electric Sprayit Co., 330 E. Colfax Ave., South Bend, Ind
Eureka Sprayers, Inc., 87-23 130th, Long Island City, N. Y.
Ideal Air Brush Mfg. Co., 203 Lafayette, New York, N. Y.
Kellogg Mfg. Co., 97 Humboldt, Rochester, N. Y.
Koch Bros. Mfg. Co., 2339 Nelson, Chicago, Ill.
K B. See Koch Bros. Mfg. Co.
Metal Specialties Mfg. Co., 328 N. Kedzie Ave., Chicago.
Macleod Co., 2232 Bogen, Cincinnati, O.
Paasche Air Brush Co., 1911 Diversey Parkway, Chicago, Ill
Pioneer Air Compressor Co., 176 Grand, New York, N. Y.
Presto. See Metal Specialties Mfg. Co.
Simons Paint Spray Brush Co., 17 Maryland Ave., Dayton, O.
Simplex Spray Equipment Co., 552 W. Lake, Chicago, Ill.
Sprayit. See Electric Sprayit Co.
Wold Air Brush Mfg. Co., 2173 N. California Ave., Chicago, Ill.
SPREADERS, COIL & LOOP. See Winding Machines Armature & Field Coil.

SPRING MAKING MACHINES

Sleeper & Hartley, Inc., Worcester, Mass.

SPRINGS,

Advance Spring & Wire Co., Carroll Ave. & Wood St., Chicago.
Barnes-Gibson-Raymond, Inc., 6400 Miller Ave., Detroit, Mich.
Cary Spring Works, Inc., 240 W. 29th St., New York, N. Y.
Chapin Co., Chas. E., 227 Fulton, New York, N. Y.
Cleveland Wire Spring Co., Cleveland, O.
Cook Spring Co., Ann Arbor, Mich.
Cuyahoga Spring Co., Berea Rd., Cleveland, O.
Dunbar Bros. Co., Bristol, Conn.
Eureka Tinware Mfg. Co., 135 W. 20th, New York, N. Y.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Gibson Co., Wm. D., 1800 Clybourn Ave., Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hunter Pressed Steel Co., Landsdale, Pa.
Lee Spring Co., 34 Main, Brooklyn, N. Y.
Miller & Van Winkle, Inc., 18 Bridge, Brooklyn, N. Y.
Newcomb Spring Corp., 234 40th, Brooklyn, N. Y.
Peck Spring Co., Plainville, Conn.
Peterson Spring Co., 1660 Beard Ave., Detroit, Mich.
Rapid Spring Co., 222 Second Ave., Pittsburgh, Pa.
Raymond Mfg. Co., Corry, Pa.
Standard Spring and Manufacturing Co., 236-42nd St., Brooklyn, N. Y.
Steinen & Co., 297 Washington, Newark, N. J.
Wallace Barnes Co., Bristol, Conn.
Young Industries, Inc., L. A., Detroit, Mich.
STAMPED BOXES. See Cabinets, Sheet Steel.
STAMPINGS, Fibre. See Fibre.
Sheet Metal. See Fixture Fittings.
Sheet Steel. See Stampings, Sheet Steel.
Small. See Stampings, Small.

STAMPINGS, Sheet Steel

Heavy Stamping and Drawing.
Acklin Stamping Co., 1925 Nebraska, Toledo, O.
American Stamping Co., 978 E. 64th, Cleveland, O.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bossert Corp., Utica, N. Y.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Hubbard & Co., Pittsburgh, Pa.
Janney, Steinmetz & Co., 1421 Chestnut St., Philadelphia.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Metropolitan Devices Corp., 1250 Atlantic Ave., Brooklyn.
Mullins Mfg. Corp., Washing Machine Division, Salem, Ohio. (Vitreous Enameled)
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
Truscon Steel Co., Youngstown, O.

STAMPINGS, Small

Small Stamped Metal Parts for Electrical Devices.
Advance Tool & Die Casting Co., 1654 Holton, Milwaukee,
Aerial Machine & Tool Co., 79 Grand, New York, N. Y.
American Emblem Co., Utica, N. Y.
American Radio Hardware Co., 135 Grand, New York, N. Y.
American Stamping Co., 978 E. 64th, Cleveland, O.
Arrow Automatic Products Corp., 37 Vestry, New York, N. Y.
Beaver Mfg. Co., 625 N. Third, Newark, N. J.
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Bull Dog Electric Products Co., Detroit, Mich.
Chase Brass & Copper Co., Waterbury, Conn.
Clarke Metal Products, Inc., 490 Hancock Ave., Bridgeport, Conn.
Eureka Tool & Machine Co., Newark, N. J.
Faries Mfg. Co., Decatur, Ill.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
Geuder, Paeschke & Frey, St. Paul & 15th, Milwaukee,
Grammes & Sons, Inc., L. F., Allentown, Pa.
Gray Bros. Co., Piano, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Hubbell, Inc., Harvey, Bridgeport, Conn.
Krischer's Mfg. Co., 255 Calyer, Brooklyn, N. Y.
Lansing Stamping Co., Lansing, Mich.
Lenz Metal Stamping Wks., J., 199 Franklin, New York.
Massachusetts Machine Shop, Inc., Boston, Mass.
Mathews Mfg. Co., 104 Gold, Worcester, Mass.
Mechanics Tool & Stamping Co., 7 Summer, Worcester, Mass.
Mutual. See Bull Dog Elec. Products Co.
Patton-MacGuyer Co., Providence, R. I.
Paul & Beekman Mfg. Co., 1734 N. Fifth, Philadelphia, Pa.
Plume & Atwood Mfg. Co., 474 Bank, Waterbury, Conn.
Precision Metal Workers, 3100 Carroll Ave., Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Risdon Mfg. Co., Naugatuck, Conn.
Scovill Mfg. Co., Waterbury, Conn.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Signal Elec. Mfg. Co., Menominee, Mich.
Steinen & Co., 297 Washington, Newark, N. J.
Thomas & Skinner Steel Products Co., 1102 E. 23rd, Indianapolis, Ind.
United Stamping & Mfg. Co., Cleveland, Ohio.
Waterbury Brass Goods Corp., Waterbury, Conn.
Waterbury Button Co., Waterbury, Conn.
Waterbury Mfg. Co., 236 Grand, Waterbury, Conn.
Waterbury Metal Wares Co., Waterbury, Conn.
Zierick Machine Wks., F. R., 68 E. 131st St., New York, N. Y.

STANDS, Armature

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17 & Cambria Sts., Philadelphia, Pa.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Ridion Company, Frank, Boston, Mass.
Weidenhoff, Joseph, 4352 Roosevelt Rd., Chicago, Ill.
STARTERS, Motor. See Controllers, Motor; Switches, Remote Control; Switches, Knife; Safety; Switches, Snap (Heavy Duty).
STEATITE. See Cores, Resistance Coil.
STEEL CASTINGS. See Castings, Steel.

STEEL for Electric Appliances

Elyria Iron & Steel Co., Elyria, O.
Ryerson & Son, Jos., 2558 W. 16th, Chicago, Ill.

STEEL, Magnet

Ajax Electrothermic Corp., Trenton, N. J.
Hercules Elec. Steel Corp., 145 Lafayette St., New York.
Indiana Steel Products Co., 4545 S. Western Ave., Chicago.
Ludlum Steel Co., Watervliet, N. Y.

STEEL SHEETS

Agathon. See Central Alloy Steel Corp.
Allegheny Steel Co., Brackenridge, Pa.
American Rolling Mill Co., Middleton, Ohio.
American Sheet & Tin Plate Co., Frick Bldg., Pittsburgh.
Armelec. See Empire Steel Corp.
Central Alloy Steel Corp., Massillon, O.
Cyclops Steel Co., Titusville, Pa.
Dynelec. See Empire Steel Corp.
Empire Steel Corp., Mansfield, O.
Firth-Sterling Steel Co., McKeesport, Pa.
Manelec. See Empire Steel Corp.
Metelec. See Empire Steel Corp.
Newport Rolling Mill Co., Newport, Ky.
Polelec. See Empire Steel Corp.
Republic Iron & Steel Co., 335 Market, Youngstown, O.
Trunelec. See Empire Steel Corp.
Unilov. See Universal Steel Co.
Universal Steel Co., Bridgeville, Pa.
Wheeling Steel Corp., Wheeling, W. Va.
STEEL, STRIP. See Strip Steel.

STOCKS, Dies and Reamers

Hall-Will, Inc., Erie, Pa.
Red-E-Hall. See Hall-Will, Inc.
Toledo Pipe Threading Machine Co., 1445 Summit, Toledo, O.

STONES, Commutator

Acme. See Green Equipment Corp.
Caro. See Electric Service Supplies Co.
Cleveland Stone Co., Union Trust Bldg., Cleveland, O.
Co-operative Utilities Co., 1503 Columbia Ave., Philadelphia, Pa.
Diamond Dee. See Co-operative Utilities Co.
Electric Service Supplies Co., 17th and Cambria, Philadelphia, Pa.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Electric Co.
Lombard & Co., Somerville, Mass.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, O.

STOOLS, Factory; Steel

Angle Steel Stool Co., Plainwell, Mich.
Chicago Wire Chair Co., 613 N. La Salle, Chicago, Ill.
Royal Metal Mfg. Co., 1136 South Michigan Ave., Chicago.
STORGE
Battery Plates. See Plates, Storage Battery.
Battery, Separators. See Separators.
Tools. See Tools, Storage Battery.
STRAINING MACHINES, INSULATION. See Wire Manufacturing Machines.

STRAIGHTENERS, Armature Shaft

Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
STRANDING MACHINES. See Wire Manufacturing Machines.

STRIP STEEL

(Hot and Cold Roll).
Acme Steel Co., 2840 Archer Ave., Chicago, Ill. (Hot & Cold).
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. (Cold).
American Tube & Stamping Plant (Stanley Wks.) Bridgeport, Conn. (Hot & Cold.)
Ansonia Steel Co., 135 William, New York, N. Y. (Cold.)
Barnes Co., Wallace, Bristol, Conn. (Hot.)
Central Alloy Steel Corp., Massillon, O. (Hot.)
Griffin Mfg. Co., Erie, Pa. (Hot & Cold.)
Laclede Steel Co., 8th & Olive Sts., St. Louis, Mo. (Hot.)
Latrobe Electric Steel Co., Latrobe, Pa. (Hot & Cold.)
Republic Iron & Steel Co., 335 Market, Youngstown, O
Sharon Steel Hoop Co., Sharon, Pa. (Hot.)
Stanley Wks., New Britain, Conn. (Hot & Cold.)
Steel and Tubes, Inc., Cleveland, O. (Hot & Cold.)
Superior Steel Corp., Union Trust Bldg., Pittsburgh, Pa. (Hot & Cold.)
West Leechburg Steel Co., Farmers Bank Bldg., Pittsburgh, Pa. (Hot & Cold.)

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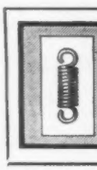
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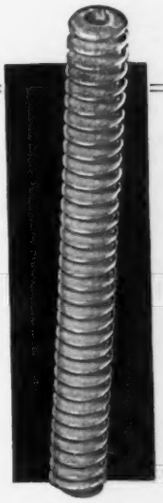

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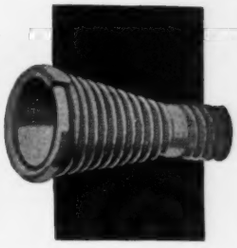

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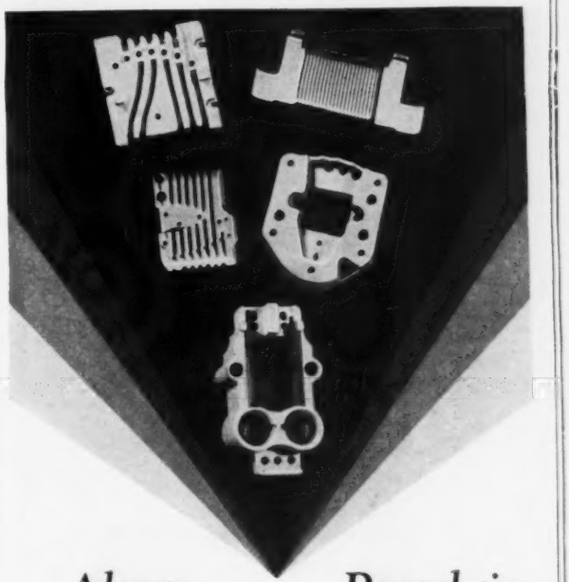

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STRIPPERS, Wire

Acme. See A. Laubscher.
Artos Engineering Co., 69 Wisconsin, Milwaukee, Wis. (Cutting, Stripping and Measuring).
Austin Co., M. B., 106 S. Desplaines, Chicago, Ill.
Dicke Tool Co., Downers Grove, Ill.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
E-Z. See Pyramid Products Co.
F. F. See France Mfg. Co.
Foley Saw Tool Co., 655 Foley Bldg., 9 Main, N. E., Minneapolis, Minn. (Bench Type Wire Stripper.)
France Mfg. Co., 10325 Berea Rd., Cleveland. (Motor Driven.)
Goehst. See Klein & Sons.
Hartman. See Service Sales & Mfg. Co.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill
Ives Mfg. Co., Meriden, Conn.
Klein & Sons, Mathias, Chicago, Ill.
Laubscher, A., 77 Fort Pleasant Ave., Springfield, Mass.
Perfection. See Weber Machine Corp.
Service Sales & Mfg. Co., 17005 Melgrave Ave., Cleveland, Ohio.
Speedcraft. See Wire Stripper Co.
Weber Machine Corp., 33 S. Water, Rochester, N. Y.
Wire Stripper Co., 507 Erie Bldg., Cleveland, O.
Zierick Machine Wks., F. R., 6 Howard, New York City. (Motor Driven Stripper & Twister).

SWITCHBOARD INSTRUMENTS. See Instruments, Portable and Switchboard.
SWITCHBOARD OPALS. See Lonsco.
SWITCHBOARDS, SLABS AND BARRIERS
See Asbestos Slabs; Molded Insulation; Slate; Soapstone.

SWITCH (Switches).
Arms. See Posts, Binding.
"Across the Line" Type. See Controllers, Motor.
Baby Knife. See Switches, Battery.
Battery. See Switches, Battery.
Canopy. See Switches, Snap.
Clock Operated. See Switches, Time.
Feed Through. See Switches, Snap.
Fixture. See Switches, Snap.
Float. See Switches, Tank.
Flush. See Switches, Snap.
Handles. See Handles, Wood
Knife, Baby. See Switches, Battery & Baby Knife.
Lever Radio. See Radio Mounting.
Lever. See Switches, Snap, Lever.
Limit. See Controllers, Motor.
Mercury. See Switches, Mercury
Motor Starting. Magnetic Type. See Controllers.
Motor Starting. Non-Magnetic. See Switches, Motor Starting.
Pendant. See Switches, Snap.
Pressure Regulating. See Controllers.
Push Button, Snap. See Switches, Snap.
Push Button, Motor Starting. See Switches, Remote Control.
Radio Receiver. See Radio Mountings.
Range. See Switches Snap; Heavy Duty
Remote Control. See Switches, Remote Control.
Reversing. See Controllers.
Rotary. See Switches, Snap.
Safety. See Switches, Knife.
Snap. See Switches, Snap.
Starter Type. See Controllers.
Storage Battery. See Switches, Storage Battery.
Surface. See Switches, Snap.
Tank. See Switches, Tank.
Time. See Switches, Time.
Toggle. See Switches, Snap.
Tumbler. See Switches, Snap.

SWITCHES, Battery and Baby Knife

Cut-Out Switches.
Anti-Wood. See Keil & Son, Francis.
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.
Bryant Electric Co., Bridgeport, Conn.
Chapman. See Frank W. Morse & Co.
Chicago Elec. Mfg. Co., 2301 S. Halsted, Chicago, Ill.
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 15th, Chicago.
Circle T. See Trumbull Elec. Mfg. Co.
Connecticut Elec. Mfg. Co., Bridgeport, Conn.
Crown. See Edwards & Co., Inc.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Edwards & Co., Inc., 140th & Exterior, New York, N. Y.
Electrad, Inc., 428 Broadway, New York, N. Y.
Eureka. See Frank W. Morse & Co.
Fahnestock Elec. Co., cor. East Ave. and 8th, Long Island City, N. Y.
Handy. See Chicago Elec. Mfg. Co.
H. & H. See Hart & Hegeman Div.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. Hartford, Conn. (Push Button.)
Harwood. See Frank W. Morse & Co.
Heinemann Elec. Co., Philadelphia, Pa.
Jost. See Frank W. Morse & Co.
Kappa. See Trumbull Elec. Mfg. Co.
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.
Kendrick & Davis Co., Lebanon, N. H.
Keystone. See Frank W. Morse & Co.
King Mfg. Co., B. C., 302 Park Ave., Brooklyn, N. Y.
Knox Porcelain Corp., Knoxville, Tenn.
K-P-P Elec. Co., 855 Howard St., San Francisco, Cal.
Kurz & Root, Appleton, Wis.
Leviton Mfg. Co., 226 Newell, Brooklyn, N. Y.
Lyons Mfg. Co. (Mt. Carmel), New Haven, Conn.
Majestic Elec. Mfg. Co., 80 N. 12th St., St. Louis, Mo.
Manhattan Elecl. Supply Co., 190 Sixth Ave., New York.
Morse Co., Frank W., Boston, Mass.
Partrick & Wilkins Co., Philadelphia, Pa.
Porcelain Products, Inc., Findlay, Ohio.
Powerlite Switchboard Mfg. Co., 4149 E. 79th, Cleveland, O.
Pullrite. See Frank W. Morse & Co.
Reliabls Electric Co., 3145 Carroll Ave., Chicago, Ill.
Samson Electric Co., Canton, Mass.
Spero Elec. Mfg. Co., E. 33rd and Woodland Ave., Cleveland
Sta-Rite. See Frank W. Morse & Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
Wood Elec. Co., C. D., 565 Broadway, New York, N. Y.

SWITCHES, Mercury

(For Temperature Control Apparatus.)
Con-Tac-Tor. See Time-O-Stat Controls Co.
Cooper Hewitt Electric Co., 470 Eighth, Hoboken, N. J.
Cramblet Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
General Kontroler Co., 200 E. First, Dayton, O.
Kon-nec-tor. See Cooper Hewitt Elec. Co.
Kontax. See General Kontroler Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Time-O-Stat Controls Co., Elkhart, Ind.

SWITCHES, Motor Starting

Accessible. See Trumbull-Vanderpoel Elec. Mfg. Co.
Aces. See Colt's Patent Fire Arms Mfg. Co.

Adam Elec. Co., Frank, St. Louis, Mo.
Aurora Steel Products Co., Aurora, Ill.
Barber Elec. Mfg. Co., North Attleboro, Mass.
Bull Dog Electric Products Co., Detroit, Mich.
Circle T. See Trumbull Elec. Mfg. Co.
Colt's Patent Fire Arms Mfg. Co., Hartford, Conn.
Columbia Metal Box Co., 226 E. 144th, New York, N. Y.
Crouse-Hinds Co., Syracuse, N. Y.
E. W. See Trumbull Elec. Mfg. Co.
FA. See Adam Elec. Co., Frank.
F. A. Triumph. See Metropolitan Elec. Mfg. Co.
Federal Steel Products Co., 2 Ave. L., Newark, N. J.
Large-Dall Mfg. Co., 606 Cherry, Philadelphia, Pa.
Leonard Elec. Mfg. Co., 2907 Perkins Ave., Cleveland, O.
Lundy Co., E. A., Fulton Bldg., Pittsburgh.
MacMillen Mfg. Co., 1400 N. Spring, Los Angeles, Cal.
Major. See Adam Elec. Co., Frank.
Mason. See Trumbull-Vanderpoel Elec. Mfg. Co.
Metropolitan Device Corp., 1250 Atlantic Ave., Brooklyn, N. Y.
Metropolitan Elec. Mfg. Co., Blvd. at 14th, Long Island City, N. Y.
Murray. See Metropolitan Device Corp.
Mutual. See Bull Dog Elec. Products Co.
Naro. See Metropolitan Elec. Mfg. Co.
Noark. See Colt's Patent Fire Arms Mfg. Co.
Nublade. See Colt's Patent Fire Arms Mfg. Co.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Robbins & Myers, Inc., Springfield, O.
Safe-Lock. See Trumbull-Vanderpoel Elec. Mfg. Co.
Safelock. See Westinghouse Elec. & Mfg. Co.
Schmuckler & Sons, 2232 N. 28th, Philadelphia, Pa.
square D Co., Detroit, Mich.
S. S. See Wadsworth Elec. Mfg. Co.
Tanner & Co., Wm. F., 511 Sharp, Baltimore, Md.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Trumbull-Vanderpoel Elec. Mfg. Co., Bantam, Conn.
T. V. Safelock. See Trumbull-Vanderpoel Elec.
Unisafti. See Metropolitan Device Corp.
Unit-Versal. See Bull Dog Elec. Products Co.
Universal Metal Box & Products Co.
V. V. Fittings Co., 711 Cherry, Philadelphia, Pa.
Wadsworth Elec. Mfg. Co., Covington, Ky.
Westinghouse Elec. & Mfg. Co., Mansfield, O.

SWITCHES, Remote Control

Push Button, Magnetically Operated.
Adam Electric Co., Frank, St. Louis, Mo.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Switch Co., 154 Grand, New York, N. Y.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Cutler-Hammer, Inc., 1287 St. Paul Ave., Milwaukee.
Diamond H. See Hart Mfg. Co.
Dunco. See Struthers Dunn, Inc.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
H. P. See Palmer Elec. & Mfg. Co.
Industrial Controller Div. of Square D Co., Milwaukee, Wis.
Kato Engr. Co., Mankato, Minn.
Major, F. A., System. See Adam Elec. Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Palmer Elec. & Mfg. Co., Waltham, Mass.
Precise Mfg. Co., 254 Mill, Rochester, N. Y.
Protectoswitch. See Precise Mfg. Co.
R. C. O. C. See South Bend Current Controller Co.
Sauter. See Cramer & Co., R. W.
Signal Engineering & Mfg. Co., 146 W. 14th, New York
South Bend Current Controller Co., South Bend, Ind.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Takamine Corp., 208 Rawson St., Long Island City, N. Y.
Teeple Co., L. R., 540 E. Ninth, Portland, Ore.
Triplock. See Monitor Controller Co.
Trumbull Elec. Mfg. Co., Plainville, Conn.
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

SWITCHES, Snap

	KEY
Feed Through	See p
Fixture (Canopy, Candelabra and Key Arm)	See F
Flush	See f
Lever, Toggle, Tumbler	See L
Pendant	See p
Push Button	See P
Rotary	See R
Surface	See s

See Also Switches, Snap; Heavy Duty.

Adam Electric Co., Frank, St. Louis, Mo.	f					
Anylite Elec. Co., Ft. Wayne, Ind.					L	
Arrow Electric Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.	f	sp	P	R	L	F
Arrow Head. See Arrow Elec.						
Beaver Mfg. Co., 625 N. Third, Newark, N. J.	f	p	P			F
Best. See United States Elec. Mfg. Corp.						
Brascolite. See Guth & Co., Edwin.						
Bremer Elec. Mfg. Co., 139 N. 7th, Philadelphia, Pa.	f					
Bridgeport Switch Co., 209 Center, Bridgeport, Conn.					L	F
Bryant Elec. Co., Bridgeport, Conn.	f	sp	P	R	L	F
B. S. Co. See Bridgeport Switch Co.						
Caring Tool & Machine Co., 32 Union Place, Hartford, Conn.						F
Circle F. Mfg. Co., Trenton, N. J.	f		P		L	F
Circle T. See Trumbull Elec. Mfg. Co.						
Connecticut Elec. Mfg. Co., Bridgeport, Conn.		p	P	R	L	F
Crouse-Hinds Co., Syracuse, N. Y.					L	
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee, Wis.			P		L	
Diamond H. See Hart Mfg. Co.						
Dugle. See Bryant Elec. Co.						
Economy Fuse Mfg. Co., 2717 Greenview Ave., Chicago, Ill.						F
Gaynor Elec. Co., Bridgeport, Conn.	f				L	
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn.	f	sp	P	R	L	F
Glo-Guide. See Bryant Elec. Co.						
Gold Star Push Switch. See Hart & Hegeman.						
Guth & Co., Edwin, 2615 Washington Ave., St. Louis, Mo.						F
Hart Mfg. Co., Hartford, Conn.	f	sp	P	R	L	
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co. (Door Bolt Control)	f	sp	P	R	L	F
Hart. See Hart & Hegeman.						
H. & H. See Hart & Hegeman Mfg. Co.						
Hubbell, Inc., Harvey, Bridgeport, Conn.		sp			L	F
Jost. See Morse, Frank W.						
Keil & Son, Francis, 401 E. 163rd, New York, N. Y.	f		P			
Leviton Mfg. Co., 226 Newell, Brooklyn						F
Levolier. See McGill Mfg. Co.						
McGill Mfg. Co., Valparaiso, Ind.	f				L	F
Marks Products Co., 80 N. Ninth, Brooklyn, N. Y.					L	F
Metropolitan Elec. Mfg. Co., Blvd at 14th St., Long Island City, N. Y.	s			R		
Morse Co., Frank W., 291 Congress, Boston			P			

National. See Standard Elec. Mfg. Co.
New England. See Paulding, John L.
Nutmeg. See Hubbell, Harvey, Inc.
Operite. See Morse Co., Frank W.
Pass & Seymour, Solvay Sta., Syracuse, N. Y. f sp P .. L F
Paulding, John I, New Bedford, Mass. f s P
Pen Tap. See Beaver Mfg. Co.
Perkins. See Bryant Elec. Co.
Pilot Electric Mfg. Co., 323 Berry, Brooklyn, N. Y. L
Pilotoggle. See Pilot Elec. Mfg. Co.
Pullrite. See Morse, Frank W.
Rodale Mfg. Co., 200 Hudson, New York p
Sears, Henry D., 80 Boylston, Boston. f sp P R L F
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa. P
Snapit. See Marks Products Co.
Spartan. See Bryant Elec. Co.
Standard Elec. Mfg. Co., 941 Wrightwood Ave., Chicago, Ill. f s P R L
Trigle. See Bryant Elec. Co.
Trumbull Elec. Mfg. Co., Plainville, Conn. f s P R L
Tumbolier. See Hart & Hegeman.
Twi-Lite. See McGill Mfg. Co.
United States Elec. Mfg. Corp., 222 W. 114th, New York, N. Y. f
Victor. See Keil & Son, Francis.
Weber. See Sears, Henry D.
Werkrite. See Morse, Frank W.
Yankee. See Bryant Elec. Co.

SWITCHES, Snap; Heavy Duty

Heavy duty rotary snap switches for Electric Range and Small Motor Control.
Arrow Elec. Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.
Bryant Electric Co., Bridgeport, Conn.
Diamond H. See Hart Mfg. Co.
Domestic Electric Co., 7723 St. Clair Ave., Cleveland, Ohio.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Hart Mfg. Co., Hartford, Conn.
Hart & Hegeman, Div. of Arrow-Hart & Hegeman Elec. Co., Hartford, Conn.

SWITCHES, Storage Battery; Automatic Disconnecting

Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Penn Electric Switch Co., Des Moines, Ia.
Radiolec. See Cutler-Hammer Mfg. Co.

SWITCHES, Tank

Blackburn-Smith Corp., 25 W. 45th, New York, N. Y.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Electrical Repair Co., 240 W. 25th, New York, N. Y.
General Electric Co., Schenectady, N. Y.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Leader-Trahern Products Co., Decatur, Ill.
Ostrander Elec. Wks., W. R., 911 Atlantic Ave., Brooklyn.
Penn Elec. Switch Co., 20th & Walnut, Des Moines, Ia.
Sundh Elec. Co., Parkhurst St. at Ave. C, Newark, N. J.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

SWITCHES, Time (Automatic Clock Operated Switches)

Anderson Mfg. Co., Albert & J. M., 289 A, Boston, Mass.
Astrachron. See Gem Engineering Co.
Automatic Elec. Heater Co., 1505 Race, Philadelphia, Pa.
Automatic Elec. Mfg. Co., Mankato, Minn.
Automatic Lighting Co., 831 Greenmount Ave., Baltimore.
Automatic Sprinkler Corp. of America, 910 B. of L. E. Bank Bldg., Cleveland, Ohio.
Automatic Timer Co., 1841 Euclid Ave., Cleveland, O.
Berry, A. Hall, 73 Murray, New York, N. Y.
Brown & Pengilly, Inc., 1264 Folsom, San Francisco, Cal.
Buckeye Time Switches, Inc., 1557 St. Clair Ave., Cleveland, O.
Cackle. See Berry A. Hall.
Campbell Electric Mfg. Co., 15 Stewart, Lynn, Mass.
Clark. See Automatic Heater Co.
Can-tac-tor. See Absolute Con-tac-tor Corp.
Cramer & Co., R. W., 136 Liberty, New York, N. Y.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Frisch, Walter P., 104 Linden, Rochester, N. Y.
Gem Engineering Co., Hempstead, N. Y.
General Electric Co., Schenectady, N. Y.
Go-N-Set. See G. & S. Research Lab.
G. & S. Research Laboratory, 1269 Cochran Ave., Los Angeles, Cal.
Hart Mfg. Co., Hartford, Conn.
Hartford. See Berry A. Hall.
Horni Signal Mfg. Co., 290 Hudson, New York, N. Y.
Jewel. See Time Switch Sales & Service.
Knowles, W. E., 2889 Broadway, Oakland, Cal.
Kwixset. See Thompson Clock Co.
Lamp-Lighter. See Robbins & Myers Co.
Liberty Bell Mfg. Co., Minerva, Ohio.
Mercury Time Switch Co., Marine City, Mich.
Northwestern Clock Co., Omaha, Neb.
Ohio Time Switch Co., 1439 St. Clair Ave., Cleveland.
Paragon Elec. Co., 409 S. Dearborn, Chicago, Ill.
Racine. See Reliance Automatic Ltg. Co.
Radio Owl, 2269 E. 51st, Los Angeles, Cal.
Radio Switchman. See R-V Mfg. Co.
Reliance Automatic Ltg. Co., 1925 Meade, Racine, Wis.
Research Mfg. Laboratory, 1269 Cochran Ave., Los Angeles.
Robbins & Myers Co., Springfield, O.
Ross Safety Switch Corp., 1 E. 42nd, New York, N. Y.
R-V Mfg. Co., Marshfield, Mass.
Sauter. See Cramer & Co.
States Co., Hartford, Conn.
Thompson Clock Co., H. C., Bristol, Conn.
Time Switch Sales & Service, 1841 Euclid Ave., Cleveland, O.
Tork Clocks, Inc., 12 E. 41st, New York, N. Y.
Walser Automatic Timer Co., 342 Madison Ave., New York
Zenith Elec. Co., 537 S. Dearborn, Chicago, Ill.

TACHOMETERS

Speed Indicators, Speedometers, Revolution Counters.
Biddle, James G., 1211 Arch, Philadelphia, Pa.
Brown Instrument Co., Wayne & Windrim, Philadelphia.
Comet Elec. Co., 47 Union Trust Bldg., Indianapolis, Ind
Durant Mfg. Co., 655 Buffum, Milwaukee, Wis.
Electric Tachometer Corp., Spring Garden & Broad St. Philadelphia, Pa.
Holtzer-Cabot Elec. Co., Boston, Mass.
Leeds & Northrup Co., 4901 Stenton Ave., Philadelphia, Pa.
Productimeter. See Durant Mfg. Co.
Standco. See Sticht & Co.
Sticht & Co., H. H., 13 Park Row, New York, N. Y.
Veeder Mfg. Co., 14 Sargeant, Hartford, Conn.
Weston Elecl. Instrument Co., 582 Frelinghuysen Ave., Newark, N. J.
Zernickow Co., O., 15 Park Row, New York, N. Y.

TAGS, Cable; Pole and Battery

American Radio Hardware Co., 135 Grand, New York, N. Y. (Battery Lead Tags.)
Benedict Mfg. Co., East Syracuse, N. Y.
Brocklin Underground Elec'l Mfg. Co., Glenside, Pa.

Do you buy refractories in the same way you hire an executive?

DO you look for the same qualities of integrity, soundness of character and staying power? You should, because these qualities are just as important in one cog of the wheel as another.

In our long experience in making refractories, we have learned to meet new developments as well as standard requirements, with the most satisfying results.

What to Look for in Refractories

Your refractories should resist the electrical voltage at high temperature; they should not spall or spit-off while heating or cooling. They should be physically strong enough to support the heating elements at high temperature. They should be continuously uniform in all dimensions and clearly molded, with all sharp edges removed to avoid injuring the metallic resistor. In fact, they should be made by the company who, through their pioneering work, have made possible refractories with the above specifications, and who are acknowledged by the electrical industry as past masters of their art.

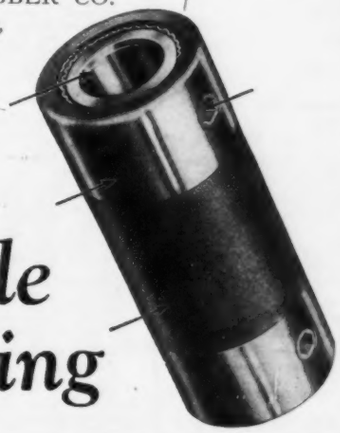
We make a complete line of refractories for electric ranges and other domestic appliances, and also tubes and cores for all types of resistance windings. Of special importance are our refractory heating element supports for electric furnaces.

THE ELECTRICAL REFRACTORIES CO.
East Palestine, Ohio

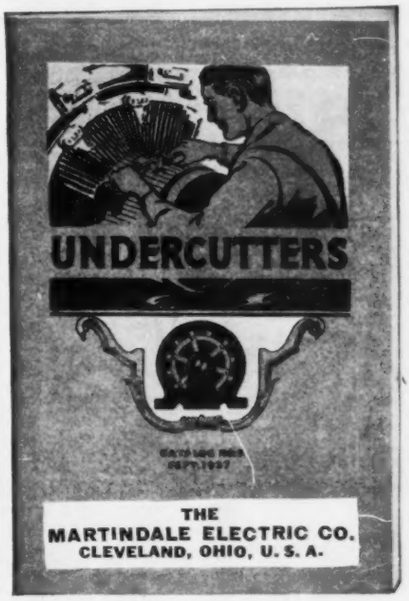
In the specifications covering your electric washing machine include *"shock absorbers"* as standard equipment

The Oneida Flexible Coupling absorbs the shocks of sudden starts and stops—it is the connecting link between a long life of trouble-free service and the total absence of annoying "servicing."
The Oneida is found on many motor-operated appliances—perhaps its application to your product might solve a disturbing problem.

DELBEE RUBBER CO.
Syracuse,
N. Y.



ONEIDA
flexible coupling



Send for this complete and comprehensive catalog showing 11 different types of motor driven undercutters for slotting commutators.

Also you will be interested in our new No. 12 General Motor Maintenance Catalog.

THE MARTINDALE ELECTRIC COMPANY
1255 West Fourth Street, Cleveland, Ohio
I am interested in your equipment; send me:

☐ No. 9 Undercutter catalog
☐ No. 12 General Motor Maintenance Catalog

Name and Title.....
Company .....
Street .....
City..... State.....4/29

TAGS, Cable—Continued
Crowe Name Plate & Mfg. Co., 1749 Grace, Chicago, Ill.
Grammes & Sons, Inc., L. F., Allentown, Pa.
International Tag Co., 319 N. Whipple, Chicago, Ill.
Premax Products, Inc., Niagara Falls, N. Y.
Viking Tool & Machine Co., 745 65th, Brooklyn, N. Y.
Waterbury Button Co., Waterbury, Conn.

TAGS, Shipping

Campbell Paper Box Co., South Bend, Ind.
International Tag Co., 319 W. Whipple, Chicago, Ill.
TANK SWITCHES. See Switches, Tank.
TANKS, TINNING. See Wire Manufacturing Machines

TAPE, Asbestos

American Asbestos Co., Norristown, Pa.
Asbestos Fibre Spinning Co., North Wales, Pa.
General Asbestos & Rubber Co., Charleston, S. C.
Johns-Manville Corp., New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Niagrite. See Johns-Manville, Inc.
Shield Brand. See Mitchell-Rand Mfg. Co.

TAPE, Cotton, Linen, Silk;

Tape, Sleeving, Webbing.
Anchor Webbing Co., Nye, Pawtucket, R. I. (Cotton, Silk.)
Awabco. See Anchor Webbing Co.
Eagle. See Sidebotham, Inc., John.
General Electric Co., Schenectady, N. Y.
Gilmer Co., L. H. (Tacony), Philadelphia, Pa.
Hope Webbing Co., 1005 Main, Providence, R. I.
Krout & Fite Mfg. Co., Allegheny Ave. & Emerald Philadelphia, Pa.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sidebotham, Inc., John, 4317 Griscom, Philadelphia, Pa.
Smith Belting Co. (Germantown), Philadelphia, Pa.
Superfine. See Windsor Webbing Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Windsor Webbing Co., Pawtucket, R. I.
Worcester Braiding Co., 34 Southbridge, Worcester, Mass.

TAPE, Mica

Chicago Mica Co., 345 Campbell, Valparaiso, Ind.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mica Mfg. Co., 135 Johnson, Brooklyn, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Rubber and Friction

Ackerman. See Ackurate Rubber Co.
Ackurate Rubber Co., 25 Beaver St., New York, N. Y.
Adamson & Co., Joseph, Columbia and Germantown Aves., Philadelphia, Pa.
Adhere. See Westinghouse Elec. & Mfg. Co.
Alpha. See Johns-Manville, Inc.
Amazon. See Graybar Elec. Co.
Appleton Rubber Co., Franklin, Mass.
Black Diamond. See Dunton Co., M. W.
Boston Woven Hose & Rubber Co., Boston, Mass.
Brooklyn. See Johns-Manville, Inc.
Bull-Dog. See Boston Woven Hose & Rubber Co.
Candee. See Ackurate Rubber Co.
Canfield Rubber Co., Bridgeport, Conn.
Canton. See Plymouth Rubber Co.
Clifton. See Clifton Mfg. Co.
Clifton Mfg. Co., 65 Brookside Ave., Boston 30, Mass.
Competition. See New York Insulated Wire Co.
Double-Wear. See Dryden Rubber Co.
Dryden Rubber Co., 1014 S. Kildare Ave., Chicago, Ill.
Dundee, A. & B. See Okonite Co.
Dunton Co., M. W., 670 Eddy St., Providence, R. I.
Dutch-Brand. See Van Cleef Bros.
Elkhart Rubber Wks., Elkhart, Ind.
Firestone Tire & Rubber Co., Akron, O.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y.
Grimshaw. See New York Insulated Wire Co.
Griptite. See Canfield Rubber Co.
Holfast Rubber Co., Atlanta, Ga.
Holdtite. See United States Rubber Co.
Hydro-Proof. See Elkhart Rubber Wks.
Imperial Rubber Co., 220 Broadway, New York N. Y.
Impervo. See Canfield Rubber Co.
Irco. See Imperial Rubber Co.
Johns-Manville Corp., New York, N. Y.
Jomanco. See Johns-Manville, Inc.
Kerite Ins. Wire & Cable Co., 30 Church, New York, N. Y.
Manson. See Okonite Co.
New York Insulated Wire Co., 114 Liberty, New York, N. Y.
Okonite Co., Passaic, N. J.
O. K. See Appleton Rubber Co.
P. & B. See Ruberoid Co.
Paratex. See Appleton Rubber Co.
Paruco. See Passaic Rubber Co.
Passaic Rubber Co., Clifton, N. J.
Plymouth Rubber Co., 1400 Revere, Canton, Mass.
Red-X. St. Louis Rubber Cement Co.
Rello. See United States Rubber Co.
Ruberoid Co., 95 Madison Ave., New York, N. Y.
S. I. See Superior Insulating Tape Co.
Slipknot. See Plymouth Rubber Co.
Star. See Sullivan & Sons Mfg. Co., J.
Sticks. See Graybar Elec. Co.
Stixwell. See Clifton Mfg. Co.
Sullivan & Sons Mfg. Co., J., 2224 N. 9th, Philadelphia, Pa.
Superior Insulating Tape Co., 3044 Lambdin Ave., St. Louis.
2-Plex. See Holfast Rubber Co.
U. S. See United States Rubber Co.
United States Rubber Co., 1790 Broadway, New York, N. Y.
Van Cleef Bros., 7722 Woodlawn Ave., Chicago.
Victor. See Graybar Elec. Co.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

TAPE, Varnished Fabric

Acme Wire Co., New Haven, Conn.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Irvington Varnish & Insulator Co., Irvington, N. J.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
New Jersey Wood Finishing Co., Woodbridge, N. J.
Radiotape. See Respro, Inc.
Respro, Inc., Wellington Ave. (Auburn), Providence, R. I.
Shield Brand. See Mitchell-Rand Mfg. Co.
Sico. See Standard Insulator Co.
Standard Insulation Co., East Rutherford, N. J.
Voltape. See Respro, Inc.

TAPING MACHINES, Coil

Chapman Electric Works, P. E., 1820 Chouteau Ave., St Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. and Chestnut St., Brooklyn, N. Y.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Griswold Machine Co., George, New Haven, Conn
Hidion Company, Frank, Boston, Mass.
Segur. See Electric Service Supplies Co.

TAPING MACHINES, Wire

American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Wire Machinery Corp. of Am., New Haven, Conn.
TAPS. See Stocks, Dies and Reamers.
TENSION DEVICES, Coil Wire. See Racks, Wire Reel

TENSION MACHINES, Band Wire

Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Peerless. See Electric Service Supplies Co.

TERMINALS AND CONNECTORS

Low Tension, Secondary Terminals and Connectors.
All-in-One. See Ohio Parts Co.
Barey-Nicholson Co., 2801 Fort, W., Detroit, Mich.
Bassett Metal Goods Co., Derby, Conn. (General Selling Agent, Hatheway & Co., 16 Hudson, New York, N. Y.)
Burton-Rogers Co., Boston, Mass.
Cabelug. See Jones, Howard B.
Clark Metal Products, 490 Hancock Ave., Bridgeport.
Dixie Supply Co., 91 7th Ave., New York.
Double Grip. See Pons, Eugene
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Electron. See Bassett Metal Goods Co.
Fahnestock Elec. Co., East Ave. and 8th, Long Island City, N. Y.
Grammes & Sons, Inc., L. F., Allentown, Pa.
Ideal Clamp Mfg. Co., 198 Bradford, Brooklyn, N. Y.
Jones, Howard B., 2226 Wabansia, Chicago, Ill.
K. E. M. See Kulier Elec. Mfg. Co.
Kulier Elec. Mfg. Co., 575 Pierce Ave., Long Island City.
Morse Co., Frank W., Boston, Mass.
Nu-Way Snap. See Hatheway Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati, O.
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa.
Patton-MacGuyer Co., Providence, R. I.
Pons, Eugene, 927 Campbell Ave., Schenectady, N. Y.
Peterson Co., 7 Beverly, Providence, R. I.
Rajah Co., Bloomfield, N. J.
Salem Elec'l Supply Co., Salem, Mass.
Sherman Mfg. Co., H. B., Battle Creek, Mich.
Shure. See Burton-Rogers Co.
Tinkerbox. See Weber Elec. Wks.
Waterbury Button Co., Waterbury, Conn.
Weber Elec. Wks., Brooklyn Sta., Cleveland, O.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.
Zierick Machine Wks., F. R., 6 Howard, New York.

TEST BENCHES, Armature

Allen Electric & Equipment Co., Kalamazoo, Michigan.
Burton & Rogers Co., Boston, Mass.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Hobart Bros. Co., Troy, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Pence & Son, H. O., San Luis Obispo, Cal.
Weidenhoff, Joseph, 4352 W. Roosevelt Road, Chicago, Ill.
TESTING INSTRUMENTS. See Instruments.

TESTERS, Coil

(Includes Armature Growlers, trouble shooters, and other portable testing devices). See also Instruments
Ace. See Weidenhoff, Joseph.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Allen Electric & Equipment Co., Kalamazoo, Michigan.
Ankenbrandt, J. J., 2140 Wakeman, Toledo, Ohio.
Armeter. See Chapman Electric Works, P. E.
Bartlett Electric Products Co., Goshen, Ind. (Storage Battery).
Batt-O-Meter. See Indiana Mfg. & Elec. Co., also Case Elec.
Burton & Rogers Co., 857 Boylston, Boston, Mass.
Case Elec. Co., Marion, Ind.
Century Electrical Co., 102 Randall Ave., Syracuse, N. Y.
Chapman Elec'l Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Colpin Corp., 6110 S. Main, Los Angeles, Cal.
Columbia. See Weidenhoff, Joseph.
Comparometer Co., New Ulm, Minn.
Cowie Electric Co., E. S., 1816 McGee, Kansas City, Mo.
Economy. See Weidenhoff, Joseph.
Electric Controller & Mfg. Co., 2700 E. 79th, Cleveland.
Electric Machine Corp., 529 S. N. J., Indianapolis, Ind.
Electrotest. See Comparometer Company.
Elmco. See Electric Machine Corp.
Ev-Ri-Test. See Weidenhoff, Joseph.
Forest Electric Co., 272 New, Newark, N. J.
Ga-Jit. See General Instrument Corp.
General Instrument Corp., 225 Varick, New York, N. Y.
Herald Elec. Co., 29 East End Ave., New York, N. Y.
Hobart Bros. Co., Troy, Ohio.
Ideal. See Ankenbrandt, J. J.
Indiana Mfg. & Electric Co., Marion, Indiana.
Kietzman Electrical Mfg. Co., 234 N. Central, Gilman, Ill.
Leich Electric Co., Genoa, Ill.
Lundin Electric Machine Co., 10 Thacher, Boston, Mass.
Mallory Electric Co., Factories Bldg., Toledo, Ohio.
Marshall Elec. Co., Elkhart, Ind.
Miho Company, 717 Sycamore, Cincinnati, Ohio.
North East Electric Co., Rochester, N. Y.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn
Panelitest. See Forest Electric Co.
Portometer. See Forest Electric Co.
Portostat. See Forest Electric Co.
Presto. See Metal Specialties Mfg. Co.
Reliable Parts Mfg. Co., Wellington, Ohio.
Rex Batrystat. See Bartlett Products Co.
Scout. See Leich Electric Company.
Serwell Sales Corp., 1749 N. Winchester Ave., Chicago, Ill.
Test-All. See Colpin Corp.
Test-O-Meter. See Weidenhoff, Joseph.
Test-Rite. See Colpin Corp.
Victory. See Weidenhoff, Joseph.
Weidenhoff, Joseph, 4352 W. Roosevelt Rd., Chicago, Ill.

TESTING LABORATORIES

Elec'l Testing Laboratories, 80th St. and East End Ave., New York, N. Y.
National Elec'l Inst. Co., 162 Sidney, Cambridge, Mass.
New York Testing Laboratories, 80 Washington, New York.
Rubicon Co., 29 N. Sixth, Philadelphia, Pa.
Stupakoff Laboratories, 6617 Hamilton Ave., Pittsburgh, Pa.
THERMO JUNCTIONS. See Instruments, Laboratory Standard.

THERMOSTATIC METAL

Chace Valve Co., W. M., 1600 Beard Ave., Detroit, Mich.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I.

THERMOSTATIC METAL

For Low and High Temperatures

Our No. 1800 metal for temperatures up to 450° F.

Our No. 2800 metal for temperatures up to 1500° F.

W. M. CHACE VALVE COMPANY
1600 Beard Avenue, Detroit, Mich.

Improved Seamless Wire Co., 775 Eddy, Providence, R. I.
Interstate Products Corp., 29 Commercial, Newark, N. J.
Venbur. See Coffin Mfg. Co., B. F.
Wilco. See H. A. Wilson Co.
Wilson Co., H. A., 97 Chestnut, Newark, N. J.

THERMOSTATS

American Thermostat Co., 236 Jeliff Ave., Newark, N. J.
Automatic Appliance Co., Jackson, Mich.
Bak-Rite. See Electric Appliance Mfg. Co.
Bishop & Babcock Sales Co., 4901 Hamilton Ave., N. E., Cleveland, O.
Boston Machine Wks. Co., 7 Willow, Lynn, Mass.
Brown. See Electric Automatic Appliance Co.
Brown Instrument Co., Wayne & Windrim, Philadelphia, Pa.
Burke Controller Co., 369 Lexington Ave., New York, N. Y.
Cobb Elec. Appliance Co., 100 Massachusetts Ave., Boston.
Cramblett Engineering Div. of Time-O-Stat Controls Co., 286 Milwaukee, Milwaukee, Wis.
Coffin Mfg. Co., B. F., 30 Court, Newark, N. J.
Diamond H. See Hart Mfg. Co.
Electric Automatic Appliance Co., Denver, Colo.
Electric Heat Control Co., 5902 Carnegie Ave., Cleveland, O.
Electric Maid. See Hankscraft Co.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Freas Thermo-Electric Co., 1206 S. Grove, Irvington, N. J.
Globe Mfg. Co., Battle Creek, Mich.
Hankscraft Co., 615 E. Washington, Madison, Wis.
Hart Mfg. Co., Hartford, Conn.
Hi-Lo. See Boston Machine Wks. Co.
Hynes & Cox Elec. Corp., 408 N. Pearl, Albany, N. Y.
Interstate Products Corp., 29 Commercial, Newark, N. J.
King. See Electric Heat Control Co.
Manhattan Elect. Supply Co., 190 Sixth Ave., New York.
Marvel. See American Thermostat Co.
Mercoid Corp., 564 W. Adams, Chicago, Ill.
Moeller, A. E., 361 Bumpter, Brooklyn, N. Y.
Midget. See Coffin Mfg. Co., B. F.
National Steel Construction Co., 425 Fountenac, Seattle, Wash.
Pyratherm. See Federal Gauge Co.
Safety Regulator Co., 529 S. Mathews, Los Angeles, Cal.
Savatime Devices, Inc., 88 Manhattan, Rochester, N. Y.
Struthers Dunn, Inc., 1135 Race, Philadelphia, Pa.
Standard Thermometer Co., 65 Shirley, Boston 19, Mass.
Tagliabue Mfg. Co., C. J., 18 33rd, Brooklyn, N. Y.
Teeple Co., L. R., 540 E. 9th, Portland, Ore.
Thermoelectric. See Bishop & Babcock Sales Co.
Thermosnap. See Spencer Thermostat Co.
Time-O-Stat Controls Co., Elkhart, Ind.
Trent Co., Harold E., 439 N. 12th, Philadelphia, Pa.
Visaflame. See Mercoid Corp.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilcolator Co., 17 Nevada, Newark, N. J.

TIGHTENERS, Commutator

Elmes Engineering Works, Chas. F., 222 N. Morgan, Chicago, Ill.
TIME SWITCHES. See Switches, Time.
TINNING TANKS, WIRE. See Wire Manufacturing Machines.
TINSEL. See Wire, Insulated.

TIPS, Cord

Duro. See McEvoy, C. H.
McEvoy, C. H., 430 Broadway, Lowell, Mass.
National Acme Mfg. Co., 7500 Stanton Ave., Cleveland, O.
Norden & Co., S. 180 S. Water, Providence, R. I.
Rome Wire Co., Div. of General Cable Corp., Rome, N. Y.
Waterbury Brass Goods Corp., Waterbury, Conn.
TOOLS, Commutator Slotting. See Slotting Machines & Tools, Commutator.

TOOLS, Commutator Truing

Acme. See Green Equipment Corp.
Allen Elec. & Equipment Co., N. Pitcher St., Kalamazoo, Mich.
Binghamton Flexible Shaft Co., Binghamton, N. Y.
Central Mfg. Co., Fairfield, Ia.
Green Equipment Corp., Monadnock Block, Chicago, Ill.
Ideal Commutator Dresser Co., 1008 Park Ave., Sycamore, Ill.
Imperial. See Martindale Elec. Co.
Jordan Bros., 74 Beekman, New York, N. Y.
Martindale Elec. Co., 1255 W. Fourth, Cleveland, Ohio.

TOOLS, Storage Battery

Battery Equipment & Supply Co., 7530 Greenwood Ave., Chicago, Ill. Burning Racks, Battery Trucks, Plate Pressers, Mallets, Lead Burners and Strainers.
Battery Parts Co., Inc., Wilkinsburg, Pa. (Leads.)
Battery Tools Co., 29 Willow, Montclair, N. J.
Bosco. See Battery Equipment & Supply Co.
Bobbett Elec. Mfg. Co., 811 E. 43rd St., Chicago, Ill. (Knife Heaters.)
Canedy-Otto Mfg. Co., 1816 McGee, Chicago Heights, Ill. (Floor Vises.)
General Elec. Co., Schenectady, N. Y. (Lead Burning Outfits.)
Heet-A-Knife. See Op-al Elec. & Mfg. Co.
Ohio Parts Co., 3301 Colerain Ave., Cincinnati. (Terminals.)
Op-al Elec. & Mfg. Co., 1057 E. 30th St., Indianapolis, Ind. (Knife Heaters.)
Orum, S. R. M., 503 N. 11th, Philadelphia, Pa. (Pillar Post Sleeves, Tongs, Reamers, Strap Punches, Terminal Pullers, Steamers, Racks or Stands, Terminal Post Shapers, Battery Analyzer, Post Sealing Machine, Plate Burning Press, Press and Stands.)
Pyratip. See General Elec. Co.
Reliable Parts Mfg. Co., Wellington, O. (Steamer and Still, Filler, Separator Cutter, Clips, Carrier, Post Cutter, Terminal and Cell Puller.)
Thompson Mfg. Co., Meadville, Pa. (Reamers, Terminal Post Pullers, Pressing Tongs.)

TORCHES AND FURNACES

Acetylene, Alcohol, Gasoline, Kerosene.
Bernz Co., Otto, Newark, N. J.
Clayton & Lambert Mfg. Co., Detroit, Mich.
Dreadnaught. See Wall Mfg. Supply Co.
Klein & Sons, Mathias, Chicago, Ill.
Lasher-Peerblow Co., 237 Harrison Ave., Boston, Mass.
McGill Mfg. Co., Valparaiso, Ind.
Peerless. See Lasher-Peerblow Co.
Staysalite. See Klein & Sons, Mathias.
TORPEDO Cord. See Twine.
TORSION BALANCES. See Instruments, Laboratory Standard
TRANSFORMERS
Radio. See Radio Circuit Components.
Gas Tube Sign. See Transformers, Oil Burner.
Oil Burner Ignition. See Transformers, Low & Intermediate Voltage.

TRANSFORMERS, Low and Intermediate Voltage

For Oil Burners, Gas Tube Signs, and other special purposes.
American Bosch Magneto Corp., Springfield, Mass.
American Transformer Co., Newark, N. J.
Campbell Elec. Mfg. Co., Lynn, Mass.

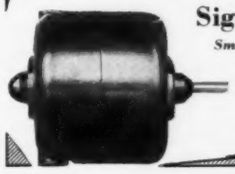
SIGNAL
MANUFACTURERS OF ELECTRICAL PRODUCTS

Motors

UNIVERSAL and Induction type small fractional horsepower motors that are adaptable to many devices that require the use of small and dependable motors—2½" x 2½" and larger frame size.

Signal Universal Motors are now used on such appliances as fans, toys, signs, electric heaters, vacuum cleaners, drink mixers, jewelers' and dentists' tools, ventilators, sewing machines, movie projectors, hair dryers, car heaters.

If your requirements demand it, we will design a new motor for you. Just send us blue prints or the appliance for which you desire motor—we'll design a motor for your approval.



Signal Electric Mfg. Co.

Small motor specialists since 1890

Menominee, Michigan

Machine - - - O.K.
Its stuffing box - - ? ?

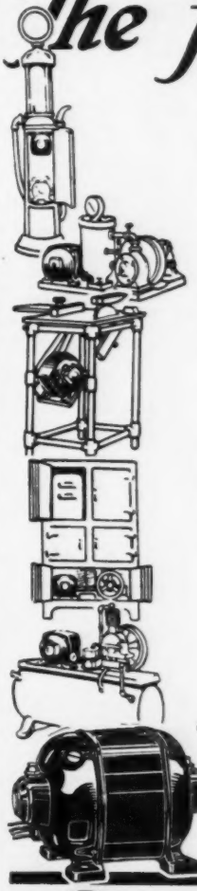
Leakage around a revolving shaft, or a bothersome stuffing box to pack—such mechanical faults hurt the sale of many a good product. The Cooke Seal Ring overcomes such defects. It eliminates leakage around the shaft, as well as stuffing box packing. Reduces friction on shaft. Costs little. Seals in any gas or oil at any pressure or vacuum whether the shaft is vertical or horizontal. Rotates *with* the shaft instead of pressing *against* it. Standard equipment on many leading pumps, compressors, electrical devices. Write us direct for full information.

COOKE
Seal Ring

46 N. Green Street, Chicago, Ill.

Dept.-M

The Foundation



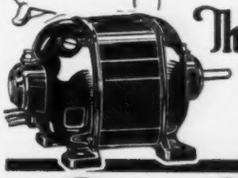
To what avail a cornerstone with its lofty monument if there be no foundation?

To the device manufacturer the motor driving the device is the foundation upon which its success depends.

The Leland Motor already forms the foundation of many successful devices. It has behind it twenty years of experience in manufacturing and designing.

A monument to the success of the Leland Motor is now being constructed, the foundation of which has been and is honesty, integrity, dependability and service. We are building a new factory.

A.C. Single Phase
D.C. Compound
A.C. Polyphase
Interchangeable Frames



The Leland Electric Co.
Dayton, Ohio.
U. S. A.

Leland
fractional horsepower
Motors

For Supreme Musical Performance

THORDARSON

AUDIO & POWER TRANSFORMERS

THORDARSON ELECTRIC MFG. CO.

Transformer Specialists Since 1895

Huron and Kingsbury Sts., Chicago, Ill.

WAXES AND COMPOUNDS

to suit every requirement. Compounded to your specifications.

One-half million pounds standard grade in storage at all times assuring prompt shipment.

Samples on request.

NATIONAL WAX CO.

189 W. Madison St., Chicago, Ill.

Cochrane's

WAXES

Compounds

Paints and Varnishes

for every insulation purpose

41 years in the business. Write for samples of our latest finishing and saturating wax.

Cochrane Chemical Company

Established 1887

432 Danforth Ave., Jersey City, N. J.

TRANSFORMERS, Low and Intermediate Voltage—Continued
Chicago-Jefferson Fuse & Elec. Co., 1505 W. 18th, Chicago.
Dongan Elec. Mfg. Co., 2985 Franklin, Detroit, Mich.
General Electric Co. (Merchandise Dept.), Bridgeport, Conn.
Manhattan Elecl. Supply Co., 190 Sixth Ave., New York.
Sorgel Electric Co., 89 W. Water, Milwaukee, Wis.
Standard Transformer Co., Warren, O.
Thordarson Elec. Mfg. Co., Huron & Kingsbury Sts., Chicago, Ill.
Uptigraft Mfg. Co., R. E., First National Bank Bldg., Pittsburgh, Pa.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Webster Electric Co., Racine, Wis.

TRANSMISSION DRIVES. See Chain, Transmission.

TRANSMITTERS, Power
Controller drive giving a variety of speeds for use in connection with coil taping machines.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.
Segur. See Electric Service Supplies Co.

TROUBLE FINDERS. See Instruments, Portable and Switchboard; also Testers, Coil.

TRUCKS, Armature. See Lifts, Armature.

TRUCKS, Factory Steel
Angle Steel Stool Co., Plainwell, Mich.

TRUING Devices, Commutator. See Tools, Commutator.

TUBE (Tubes) (Tubing) Adapters. See Radio Receiver Parts.

Brass. See Tubing, Brass.
Condenser. See Tubing, Brass and Copper.
Copper. See Tubing, Brass.
Cutters. See Stocks, Dies, etc.
Fibre. See Fibre.
Fibre Candle. See Candles.
Mica. See Mica.
Paper. See Tubes, Paper.
Platinum. See Platinum.
Pyrometer. See Cores, Resistance.
Refractory. See Cores, Resistance.
Radio. See Radio Vacuum Tubes.
Varnished Fabric. See Tubing, Varnished Fabric.

TUBES, Paper; Cores; Sleeves, Bushings
Cleveland Container Co., 10800 Berea Rd., Cleveland, O.
Climax Tube Co., Mystic, Conn.
Klimaxcore. See Climax Tube Co.
McCausland, J. E., 86 Valley, Providence, R. I.
Pairpoint Corp., New Bedford, Mass.
Reliable Elec. Co., 3145 Carroll Ave., Chicago, Ill.
Remington Mfg. Co., 939 Barnum Ave., Bridgeport, Conn.
Standard Underground Cable Co., Div. of General Cable Corp., Pittsburgh, Pa.
Stone Paper Tube Co., 33 O. N. E., Washington, D. C.
Textile Tube Co., Fall River, Mass. (Paper Sleeves.)

TUBING, Brass and Copper
American Brass Co., 25 Broadway, New York, N. Y.
Anaconda. See American Brass Co
Baltimore Tube Co., Baltimore, Md.
Bridgeport Brass Co., Bridgeport, Conn.
Bull Dog. See National Elec. Products Corp.
Chase Brass & Copper Co., Waterbury, Conn.
Conklin Brass & Copper Co., T. E., 54 Lafayette, New York.
Cook, Dunbar Smith Co., 85 Sprague, Providence, R. I.
Dallas Brass & Copper Co., 820 Orleans, Chicago, Ill.
French Mfg. Co., 128 Robbins, Waterbury, Conn.
Mueller Brass Co., Port Huron, Mich.
National Copper & Smelting Co., 1295 Coltman Rd., Cleveland, O.
National Electric Products Corp., Pittsburgh, Pa.
Randolph Clowes Co., Waterbury, Conn.
Relleum. See Mueller Brass Co.
Roberts Tube Works, 2500 Military Ave., Detroit, Mich.
Rome Brass & Copper Co., Rome, N. Y.
Rome Hollow Wire & Tube Co., Rome, N. Y.
Rome Turney Radiator Co., Rome, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa.
Summerill Tubing Co., Bridgeport, Pa.
Torrington Mfg. Co., Torrington, Conn.
United Wire & Supply Co., 1497 Elmwood Ave., Providence
Wells Co., A. H., Watertown Ave., Waterbury, Conn.
Wolverine Tube Co., 1415 Central Ave., Detroit, Mich.

TUBING, Flexible Metallic
(Flexible Tubing.)
Almond Mfg. Co., T. R., Ashburnham, Mass.
American Metal Moulding Co., 146 Coit St., Irvington, N. J.
Auto-Brassflex. See National Metal Molding Co.
Auto-Steelflex. See National Metal Molding Co.
Breeze Corp., Inc., 24 S. 6th, Newark, N. J.
Fischer Spring Co., Chas., 238 Kent Ave., Brooklyn, N. Y.
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa.
Riflex. See United Metal Hose Co.
Sleeper & Hartley, Inc., Worcester, Mass.
Time-O-Stat Controls Co., Elkhart, Ind.
Titeflex Metal Hose Co., Newark, N. J.
Triangle Conduit Co., Dry Harbor Rd. and Cooper Ave., Brooklyn, N. Y.
United Metal Hose Co., 724 Garrison Ave., New York, N. Y.
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Forest City Rubber Co., 1276 Ontario, Cleveland, O.
Goodrich Rubber Co., B. F., Akron, O.
Tyler Rubber Co., Andover, Mass.
Vulcanized Rubber Co., 251 Fourth Ave., New York, N. Y

TUBING, Varnished Fabric
Insulating Tubing—Spaghetti.
Acme Wire Co., New Haven, Conn.
Alpha Radio Supply Co., 520 Broadway, New York, N. Y.
Bentley-Harris Mfg. Co., Conshohocken, Pa.
Brand & Co., William, 268 Fourth Ave., New York, N. Y.
Empire. See Mica Insulator Co.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn.
Goodrich Rubber Co., B. F., Akron, O.
Insulated Duct & Cable Co., Stokes, Trenton, N. J.
Insuline Corp. of America, 78 Cortlandt, New York, N. Y.
Irvington Varnish & Insulator Co., Irvington, N. J.
Lee Tire & Rubber Co., Conshohocken, Pa.
Mica Insulator Co., 200 Varick, New York, N. Y.
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Pearce Co., R. T., Covington, Ky. (Insulated Waxed Cotton.)
Turbo. See Brand & Co.
Varflex Corp., Rome, N. Y.

TURNED-UP BOXES AND CABINETS. See Cabinets, Sheet Steel.

TWINE, Armature Winding; Torpedo Cord
Mitchell-Rand Mfg. Co., 19 Vesey, New York, N. Y.
Winne & Son, Frank W., 42 N. Front, Philadelphia, Pa.

UNDERCUTTERS, Mica. See Slotting Machines & Tools, Commutator.

UNITS, Refrigerator Condenser. See Condenser Units, Refrigerator.

UNITS, Rods and Grids, Resistance
Acme Elec. Heating Co., Dept. R, 1217 Washington, Boston.
Allen-Bradley Co., 494 Reed, Milwaukee, Wis.
Automatic Electric Heater Co., 1706 Race, Philadelphia, Pa.
Bradleyunit. See Allen Bradley Co.
Buffalo Products Co., Broome & Lafayette Sts., New York.
Burger, J. P., 1313 Columbus Rd., Cleveland, O.
Calrod. See Edison Elec. Appliance Co.
Carter Radio Co., 2422 Prospect Ave., Chicago, Ill.
Chromalax. See Edwin L. Wiegand Co.
Clark Controller Co., 1146 E. 152nd, Cleveland, O.
Crown Coloring & Chemical Co., 33 W. 17th, New York.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dalton Elec. Heating Co., 287 Bridge St., Salem, Mass.
Dalton-Marsh Co., 88 Holten, Danvers, Mass.
Darlc Co., 35 E. 21st, New York, N. Y.
Di-El-Ite. See Wirt Co.
Dixon Crucible Co., Jos., Jersey City, N. J.
Eagle Elec. Mfg. Co., 59 Hall, Brooklyn, N. Y.
Edgerest. See Industrial Controller Div.
Edgewound. See Monitor Controller Co.
Edison Electric Appliance Co., 5600 W. Taylor, Chicago, Ill
Elec. Controller & Mfg. Co., 2700 E. 79th, Cleveland, O.
Electro Thermal-Unit Co., 44 N. Fourth, Philadelphia, Pa.
Elemite. See Louthan Mfg. Co.
Flts-All. See Eagle Elec. Mfg. Co.
Fitz-All. See Rodale Mfg. Co.
Fitz-Rite. See Rodale Mfg. Co.
Fix-All. See Willow Elec. Mfg. Co.
F & M. See Hiram Marks Elec. Co.
General Electric Co., Schenectady, N. Y.
Globar Corp., Niagara Falls, N. Y.
Glo-Well. See Eagle Elec. Mfg. Co.
Gold Seal Elecl. Co. of Ohio, Inc., 250 Park Ave., New York, N. Y.
Hance-Parker Mfg. Co., Meriden, Conn.
Hankscraft Co., 615 E. Washington, Madison, Wis. (Oven Heater Unit.)
Hardwick, Hindle, Inc., 122 Greenwich, New York, N. Y.
Hexwound. See Monitor Controller Co.
Industrial Controller Div. of Square D Co., S. Pierce & Hanover Sts., Milwaukee, Wis.
Industrial Heater Co., 300 Canal, New York, N. Y.
International Resistance Co., 2006 Chestnut, Philadelphia, Pa. (Radio Resistance.)
Krischer's Mfg. Co., 255 Calyer, Brooklyn.
Louthan Mfg. Co., East Liverpool, O.
Marks, Elec. Co., Hiram, 304 Woodward Ave., Detroit, Mich
Monitor Edgewound. See Clark Controller Co.
Monitor Controller Co., 51 S. Gay, Baltimore, Md.
Nelco. See Nelson Electric Co.
Nelson Electric Co., Plant City, Fla.
Northern Electric Co., 2833 N. Western Ave., Chicago, Ill.
Ogden Mfg. Co., 3947 Armitage Ave., Chicago, Ill.
Ohmite Mfg. Co., 642 N. Albany Ave., Chicago, Ill.
Ohm-Spun. See States Co.
Op-al Elec. & Mfg. Co., 1057 W. 30th, Indianapolis, Ind
Parker & Co., J. C., 407 Bulletin Bldg., Philadelphia, Pa.
Poloron Elec. Mfg. Co., 20 Bond, New York, N. Y.
Presto Products Co., 64 University Place, New York, N. Y.
Prometheus Elec. Corp., 358 W. 13th, New York, N. Y.
Pyrox. See Westinghouse Elec. & Mfg. Co.
Reben Elec. Mfg. Co., 2024 Gravesend Ave., Brooklyn, N. Y.
Remco. See Reben Elec. Mfg. Co.
Renuall. See Ogden Mfg. Co.
Repairall. See Waage Elec. Co.
Replaceall. See Waage Elec. Co.
Resistance Laboratories, Inc., 20 W. 22nd, New York, N. Y.
Ribohm. See Ward Leonard Elec. Co.
Rodale Mfg. Co., 200 Hudson, New York, N. Y.
Security Elec. Mfg. Co., 2633 Canton St., Chicago, Ill.
Sepco. See Automatic Electric Heater Co.
Smith & Co., T. C., 3915 Powelton Ave., Philadelphia, Pa.
Smoothwound. See Monitor Controller Co.
Snoco. See Snow & Co.
Snow & Co., E. W., Rochester, N. Y.
Super. See Northern Elec. Co.

United Metal Art Mfg. Co., 293 Wyckoff Ave., Brooklyn, N.Y.
Vitrohm. See Ward Leonard Elec. Co.
Waage Elec. Co., 5100 W. Ravenswood Ave., Chicago.
Ward Leonard Elec. Co., Mt. Vernon, N. Y.
Warren Elec. Appliance Co., Warren, Pa.
Watlow Elec. Mfg. Co., 1320 N. 23rd, St. Louis, Mo.
Westinghouse Elec. & Mfg. Co., Mansfield, O.
Wiegand Co., Edwin L., 421 First Ave., Pittsburgh, Pa.
Wirt Co., 5221 Greene, Philadelphia, Pa.
VACUUM CLEANER BAGS. See Bags, Vacuum Cleaner.
VACUUM DRYING & IMPREGNATING OVENS. See Ovens, Industrial.
VACUUM PUMPS. See Pumps, Vacuum.

VALVES, Electrically Operated
Asco. See Automatic Switch Co.
Automatic Switch Co., 154 Grand, New York.
Chapman Valve Mfg. Co., Indian Orchard, Mass.
Coffin Valve Co., ft. of Tolman, Boston, Mass. (Water.)
Crane Co., S. Michigan Ave., Chicago, Ill.
Cutler-Hammer, Inc., 1288 St. Paul Ave., Milwaukee.
Dual Automatic Valve Co., Rock Island, Ill.
Electric-Valve Mfg. Co., 68 Murray, New York, N. Y.
Fabrice Thermostatic Control Co., 4750 Sheridan Rd., Chicago, Ill.
Gas-Gard Co., 375 Main St., E., Rochester, N. Y. (Gas.)
General Electric Co., Schenectady, N. Y.
Golden-Anderson Valve Specialty Co., 1385 Fulton Bldg., Pittsburgh, Pa.
Liberty Electric Corp., Stamford, Conn.
Lunkenheimer Co., Cincinnati, O.
Minneapolis-Honeywell Regulator Co., Fourth Ave. & 28th, Minneapolis, Minn.
Northside Elec. Co., 4227 Spring Grove Ave., Cincinnati, O.
Protect-U. See Zisch Engineering Corp.
Reading Steel Casting Co., Bridgeport, Conn.
Savutime Devices, Inc., 88 Manhattan, Rochester, N. Y.
St. Louis Motor Valve Co., St. Louis, Mo.
Tagliabue Mfg. Co., C. J., 18-83rd St., Brooklyn, N. Y.
Teeple Co., L. H., 540 E. Ninth, Portland, Ore. (Gas.)
Time-O-Stat Controls Co., Elkhart, Ind.
Victor. See Lunkenheimer Co.
Zisch Engineering Corp., 39 Avenue L, Newark, N. J. (Gas.)
VARNISH. See Paint, Varnish, Lacquer.
VARNISHED TAPE. See Tape, Varnished Fabric.
VARNISHED TUBING. See Tubing, Varnished Fabric.
VOLT BOXES. See Instruments, Laboratory Standard.
VOLTMETERS. See Instruments.
VULCANITE. See Rubber, Hard.

VULCANIZERS, WIRE INSULATION
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa.
Biggs Boiler Works Co., Akron, Ohio.
WASHERS, FIBRE. See Fibre.

WASHERS, Leather
Michigan Leather Washer Co., 548 E. Fort, Detroit, Mich.

WASHERS, Lock
Keystone. See Positive Lock Washer Co.
National Lock Washer Co., Newark, N. J.
Positive Lock Washer Co., Ave. A & Miller, Newark, N. J.
Shakeproof Lockwasher Co., 2513 N. Keeler Ave., Chicago.
St. Louis Malleable Casting Co., 7701 N. Conduit Ave., St. Louis, Mo.

WASHERS, Metallic
Bridgeport Brass Co., 774 E. Main, Bridgeport, Conn.
Chase Brass & Copper Co., Waterbury, Conn.
Chicago Nut Mfg. Co., 2513 Cullerton, Chicago, Ill.
Hubbard Spring Co., M. D., Pontiac, Mich.
Massachusetts Machine Shop, Inc., Boston, Mass.
New England Screw Co., Dept. A., 44 Farnsworth, Boston.
Quadriga Mfg. Co., 213 W. Grand Ave., Chicago, Ill.
Wrought Washer Mfg. Co., 46 S. Bay, Milwaukee, Wis.
WATTMETERS. See Instruments.

WAX AND COMPOUNDS
Wax and Compound, Sealing and Filling.....See W
Junction Box, Potheads, Battery Tops, Bolt Head Holes.
Wax and Compound.....See S
Saturating and Finishing, Braided Wire, Impregnating Fabric and Paper.
Chatterton's Compound.....See C
Ackurate Rubber Co., 25 Beaver, New York, N. Y. W . . .
Ajax. See Sherwin-Williams Co.
Asphalt Products Co., 6531 S. State, Chicago. . . . S . .
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. C
Biwax Corp., 208 S. La Salle, Chicago, Ill. . . . W S . .
Black Nego. See Williams Co., F. M.
Bulls-Eye. See Zinsser & Co.
Candy & Co., 35th and Maplewood Ave., Chicago W S . .
Clifton Mfg. Co., 65 Brookside Ave., Boston. C
Cochrane Chemical Co., 432 Danforth Ave., Jersey City, N. J. . . . . W S . .
Dolph Co., John C., 168 Emmet, Newark, N. J. W . . .
Dl Electric Puttie. See Ackurate Rubber Co.
Ever-Protect. See National Cable Compound Co.
Flake White. See Williams Co., F. M.
General Electric Co., Section W-234, Merchandise Dept., Bridgeport, Conn. . . . . W . . .
Geoge Co., P. A., 4153 Bingham Ave., St. Louis. W . . .

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Goldo Brown. See Williams Co., F. M.
Great Lakes Thread & Yarn Co., 5133 Wesson Ave., Detroit, Mich. ..... W
Hexsulate. See Tar Products Corp.
Imco. See Great Lakes Thread & Yarn Co.
India Red Seal. See Williams Co., F. M.
Insulatine Co., 1 Broadway, New York ..... W
Knox & Morse Co., 80 Freeport, Boston, Mass. ..... W 8
Leverite. See Mitchell-Rand Mfg. Co.
Lime Seal. See Mitchell-Rand Mfg. Co.
McGill Mfg. Co., Valparaiso, Ind. C
Mineralac Elec. Co., 1045 Washington Blvd., Chicago, Ill. ..... W
Mitchell-Rand Mfg. Co., 19 Vesey, New York .... W 8 C
Mule-Hide. See Lehon Co.
National Cable Compound Co., Mitchell, Ind. .... W
National Wax Co., 189 W. Madison, Chicago, Ill. .. 8
Nu-Blac. See Star Porcelain Co.
Par Flexo. See Williams Co., F. M.
Rubberseal. See Mitchell-Rand Mfg. Co.
Rub-Flexo. See Williams Co., F. M.
Seidner & Enequist, Inc., 36 Hausman, Brooklyn, N. Y. ..... W
Sherwin-Williams Co., Cleveland, O. ..... W C
Standard Varnish Wks., 433 4th Av., New York.. W
Standard Wax & Import Co., 110 E. 42nd, New York, N. Y. ..... W 8
Star Porcelain Co., Trenton, N. J. ..... W C
Tacrite. See Seidner & Enequist, Inc.
Tar Products Corp., Providence, R. I.
Trotter & Co., E. T., 576 Johnson Ave., Brooklyn, N. Y. ..... W 8
Waverly Oil Wks., 54th and A. V. R. R., Pittsburgh, Pa. 8
Williams Co., F. M., 1238 Prospect Ave., Brooklyn, N. Y.
Zinsser & Co., 48 Vesey, New York, N. Y. ..... W
WELDS, Lamp Lead-in. See Filaments, Incandescent

WELDING AND CUTTING OUTFITS

Electric Arc, Spot, Butt and Seam Metal Welders and Metal Cutting Outfits.
Acme Elec. Welder Co., 1850 W. Fulton, Chicago, Ill.
A. E. F. See American Electric Fusion Corp.
Agnew Electric Welder Co., Milford, Mich.
Allan Mfg. & Welding Co., Inc., 726 Washington, Buffalo.
Almanc. See Allan Mfg. & Welding Co., Inc.
Alternarc. See Electric Arc Cutting & Welding Co.
American Elec. Fusion Corp., 2610 Diversey Ave., Chicago
Ames Co., 115 Ninth, Brooklyn, N. Y.
Burke Electric Co., Erie, Pa.
Cushing Mfg. Co., 5617 Pacific Blvd., Los Angeles, Cal.
Dwyer Machine Co., Lynn, Mass.
Economy Electric Products Co., 2400 Woodland Ave., Cleveland, O.
Eisler Engineering Co., 756 S. 13th, Newark, N. J.
Electric Arc Cutting & Welding Co., 156 Jelliff Ave., Newark, N. J.
Electric Welding Co. of America, 744 Court, Brooklyn, N. Y.
Electric Welding Machine Co., 1530 Larned, E., Detroit.
Farwest Electric Welder Co., 1107 Northlake Ave., Seattle.
Federal Machine & Welder Co., Dana Ave., Warren, O.
Fleet-Weld. See Lincoln Elec. Co.
Fusion Welding Corp., 103rd St. & Torrence Ave., Chicago.
General Electric Co., Schenectady, N. Y.
General Engrg. & Supply Co., 160 5th Ave., New York, N. Y.
Gibb Welding Machines Co., Bay City, Mich.
Hansen. See Northwestern Mfg. Co.
Hollup Corp., C. H., 3333 W. 48th Place, Chicago, Ill.
Lincoln Electric Co., Cott Rd. and Kirby Ave., Cleveland.
McAdams Co., J. C., New Britain, Conn.
Northwestern Mfg. Co., 480 Clinton, Milwaukee, Wis.
Owen Elec. Mfg. Co., Fayetteville, N. C.
Plastic Arc. See Wilson Welder & Metal Co.
Pyrotip. See General Elec. Co.
Nyerson & Son, Jos. T., 2553 W. 16th, Chicago, Ill.
Seneca Electric Welder Corp., 5057 Woodward, Detroit, Mich.
Siemund Wenzel Electric Welding Co., 79 Hancock, Long Island City, N. Y.
Swift Elec. Welder Co., 2567 W. Grand Blvd., Detroit.
Taylor-Winfield Corp., Mahoning Ave., Warren, O.
Thompson Electric Welding Co., Lynn, Mass.
Una Welding & Bonding Co., 1615 Collamer Ave., Cleveland, O.
U. S. L. Battery Corp., Niagara Falls, N. Y.
Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.
Wilson Welder & Metal Co., Hoboken factory, Terminal Bldg., Hoboken, N. J.
Zeus. See Gibb Welding Machine Co.
WHEATSTONE BRIDGES. See Instruments, Laboratory Standard.

WICKS, Lubricating

Brawley, T. R., 279 20th, Brooklyn, N. Y.

WINDERS

Armature & Field Coil. See Winding Machines, Armature & Field Coil.
Coil. See Winding Machines, Armature & Field Coil.
Electromagnet. See Winding Machines, Induction Coil.
Filament. See Machines, Lamp Making.
Induction Coil. See Winding Machines, Induction Coil.
Loop. See Winding Machines, Armature & Field Coil.

WINDING MACHINES, Armature and Field Coil

Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Browning. See Mutual Foundry & Machine Co.
Chapman Electric Works, P. E., 1820 Chouteau Ave., St. Louis, Mo.
Columbia Machine Works & Malleable Iron Co., Atlantic Ave. & Chestnut St., Brooklyn, N. Y.
Comstock Mfg. Co., Wilkes-Barre, Pa.
Conran, Frederick M., 177 New York Ave., Newark, N. J.
Electric Service Supplies Co., 17th & Cambria Sts., Philadelphia, Pa.

Handy. See Armature Coil Equipment Co., 2415 Forestdale Ave., Cleveland, Ohio.
Hunsdorf, Wm., 2056 E. Fourth, Cleveland, O.
Liberty Starter Co., W. Fort & Minnie Sts., Detroit, Mich.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Lyknu. See Fredericks Co.
Munsdorf Company, W. P., 720 Frankfort, Cleveland, Ohio.
Mutual Foundry & Machine Co., Atlanta, Ga.
Onan, David W., 43 Royalstone Ave., Minneapolis, Minn.
Peerless. See Electric Service Supplies Co.
Segur. See Electric Service Supplies Co.
Superior. See Armature Coil Equipment Co.

WINDING MACHINES, Induction Coil

Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill.
Conron, Frederick M., 177 New York Ave., Newark, N. J.
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind.
Eureka Tool & Machine Co., 42 Walnut, Newark, N. J.
Leesons. See Universal Winding Co.
Lipe, W. C., 208 S. Geddes, Syracuse, N. Y.
Morris Register Co., 29th & Broadway, Council Bluffs, Iowa.
Radio Production Machinery Co., 212 Centre, New York.
Bidlon Company, Frank, 253 A St., Boston, Mass.
Universal Winding Co., Boston, Mass.
Viking Tool & Machine Co., 747 65th, Brooklyn, N. Y.
Weber & Scher Mfg. Co., 263 Sussex Ave., Newark, N. J.
Weehawken Engineering Co., 543 Gregory Ave., Weehawken, N. J.
WINDINGS. See Coils, Finished.

WINDOW SHADES, Factory

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WIRE (Cable) (Cord), Aluminum. See Aluminum.
Copper Clad. See Wire, Copper Clad.
Forms. See Forms, Wire.
Frames. See Forms, Wire.
Fuse. See Fuses and Fuse Wire.
Molybdenum. See Molybdenum.
Phosphor Bronze. See Phosphor Bronze.
Platinum. See Platinum.
Radio Bus. See Wire, Bare.
Scrapers. See Scrapers, Wire.
Strippers. See Scrapers, Wire;
Tungsten. See Filament, Incandescent Lamp.

WIRE, Bare

Armature Banding ..... See S
Copper Wire ..... See C
Iron Wire ..... See S
Phosphor Bronze ..... See B
Radio Bus Wire ..... See C
Resistance Wire ..... See R
Steel Wire ..... See S

Acme. See Alloy Metal Wire Co.
Advance. See Driver Harris Wire Co.
Alloy Metal Wire Co., Moore, Pa. ..... C R
American Brass Co., 25 Broadway, New York.
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... C R
American Electrical Works (Phillipsdale), Providence, R. I. C
American Insulated Wire & Cable Co., Div. of General Cable Corp., 954 W. 21st, Chicago. .... C 8
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... C 8
Anaconda. See American Brass Co.
Anylite Elec. Co., Fort Wayne, Ind. C
Ballast. See Gilby Wire Co.
Baltimore Copper Mills (Div. of General Cable Corp.), Baltimore, Md. C
Bassett Metal Goods Co., Derby, Conn. (General Sales Agent, Hatheway & Co., 16 Hudson, New York, N. Y. C
Belden Mfg. Co., 2310B S. Western Ave., Chicago C 8
Beldenite. See Belden Mfg. Co.
Bradford, Kyle & Co., Plymouth, Mass. ..... R
Braidite. See Cornish Wire Co.
Brenvar. See American Insulated Wire & Cable Co.
Bridgeport Brass Co., Bridgeport, Conn. C
Calido. See Driver Harris Wire Co.
Chromel. See Hoskins Mfg. Co.
Chromie. See Murray-Harris Wire Co.
Climax. See Driver Harris Wire Co.
Comet. See Driver Harris Wire Co.
Comin. See Gilby Wire Co.
Cook Plate Co., Edw. N., 70 Ship, Providence, R. I. C
Copel. See Hoskins Mfg. Co.
Copperweld Steel Co., Glassport, Pa. ..... C 8
Cornish Wire Co., 30 Church, New York, N. Y.. C
Corwico. See Cornish Wire Co.
Crapo. See Indiana Steel & Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J.. C
Cupron. See Gilby Wire Co.
Darow Mfg. Co., 97 Greene, New York, N. Y.... C
Detroit Insulated Wire Co., Detroit, Mich. C
1885. See Chicago Insulated Wire & Mfg. Co.
Driver Harris Wire Co., Harrison, N. J. ..... R
Electron. See Bassett Metal Goods Co.
Excellcier. See Branford Elec. Co.
Fullman Mfg. Co., 1209 Jefferson, Latrobe, Pa.
Gilby Wire Co., Riverside Ave., Newark, N. J. .... R
Goldmark Co., James, 83 Warren, New York.. C
Hope Webbing Co., Providence, R. I. (Braided Wire Tape) C
Hoskins Mfg. Co., 4415 Detroit, Mich. ..... R
Hudson Wire Co., Ossining, N. Y. ..... C R
Ideal. See Driver Harris Wire Co.
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. ..... C 8
Indiana Steel & Wire Co., Muncie, Ind. 8
Inland Wire & Cable Co., Sycamore, Ill. C
Karma. See Driver Harris Wire Co.
Keystone. See Fullman Mfg. Co.
Lucero. See Driver Harris Wire Co.
Marion Insulated Wire & Rubber Co., Marion, Ind. C
Monex. See Standard Alloy Wire Co.
National-Harris Wire Co., 113 Orchard, Newark.... R
Nehring Electrical Works, De Kalb, Ill. C
Nichrome. See Driver Harris Wire Co.
Novar. See Standard Alloy Wire Co.
Page Steel & Wire Co., Bridgeport, Conn. 8
Paranite. See Indiana Rubber & Insulated Wire Co.
Peerless. See Alloy Metal Wire Co.
Phillips Wire Co., Pawtucket, R. I. C
Phono-Electric. See Bridgeport Brass Co.
Premier. See Alloy Metal Wire Co.
Providence Insulated Wire Co., Providence, R. I.. C
Race. See Rome Wire Co.
Revolute Wire Co., Hastings-on-Hudson, N. Y.... C
Roebling's Sons Co., John A., Trenton, N. J..... C 8

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Rome Wire Co., Div. of General Cable Co., Rome, N. Y. C
Ross Wire Co., 69 Bath, Providence, R. I. C
Silcrimp. See Valley Narrow Fabric Co.
Seneca Wire & Mfg. Co., Fostoria, O. 8
Solar. See Gilby Wire Co.
Sparg Wire Co., J. A., Rome, N. Y. C
Standard Alloy Wire Co., Elizabeth, N. J. .... R 8
Standard Underground Cable Co. (Div. of General Cable Corp.), Pittsburgh, Pa. C
Super-Insulated Wire Co., Plymouth, Mass. C
Superior. See Alloy Metal Wire Co.
Talking Tape. See Hope Webbing Co.
Therlo. See Driver Harris Wire Co.
Tophet. See Gilby Wire Co.
Tru-Lay. See Page Steel & Wire Co.
Valley Narrow Fabric Co., Falls, R. I.
Wheeler Insulated Wire Co., Bridgeport, Conn.. C

WIRE, Copper Clad

American Steel & Wire Co., 208 S. La Salle, Chicago, Ill.
Copperweld Steel Co., Rankin, Pa.
Standard Underground Cable Co., Pittsburgh, Pa.
WIRE SOLDER. See Solder, Bar and Wire.

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Torrington Manufacturing Co., 70 Franklin, Torrington, Conn.
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Wire Machinery Corp. of Am., New Haven, Conn.

WIRE, Insulated

	KEY
Annunciator, Office, Bell Wire	See A
Asbestos Covered Heater Cord	See H
Asbestos Covered Magnet Wire	See M
Enameled Magnet Wire	See M
Fixture Wire	See R
Flexible Reinforced Heavy Duty Cord	See F
Heater Cord	See H
Ignition Cable	See R
Lamp Cord	See R
Magnet Wire	See M
Rubber Covered Wire & Cable	See R
Stove Wire	See H
Telephone Cord	See T

A-A Wire Co. (Div. of General Cable Corp), 420 Lexington Ave., N. Y. C.. R
A-1 Brand. See American Insulated.
Acme Wire Co., New Haven, Conn.
Enamaled Silk, Cotton ..... M
Amelectric. See American Elec.
American Brand. See American Insulated Wire & Cable Co.
American Brass Co., 25 Broadway, New York, N. Y. ..... A .. M
American Copper Products Corp., 233 Broadway, New York, N. Y. ..... M
American Electrical Works (Philipsdale), Providence, R. I. ..... M
American Enameled Magnet Wire Co., Muskegon, Mich. ..... M
American Insulated Wire & Cable Co. Div. of General Cable Co., 954 W. 21st, Chicago, Ill. ..... M
American Insulated Wire Corp., Div. of General Cable Co., 45 Baker, Providence, R. I. ..... R F .. A T ..
American Steel & Wire Co., 208 S. La Salle, Chicago, Ill. ..... R F H A T M
Americore. See American Steel.
Amerite. See American Steel.
Amerixe. See American Steel.
Amparak. See American Steel.
Anaconda. See American Brass Co.
Ansonia Electrical Co., Ansonia, Conn.
Silk, Cotton, Enameled ..... A .. M
Armorloid. See American Steel.
Bay State Insulated Wire & Cable Co., Paydras (Mattapan), 26, Boston. .... R
Belden Mfg. Co., 2310B S. Western Ave., Chicago, Ill. ..... R F H A T M
Beldenamel. See Belden Mfg. Co.
Beldenite. See Belden Mfg. Co.
Bishop Wire & Cable Corp., 420 E. 25th, New York, N. Y. ..... R F
Boston Insulated Wire & Cable Co., 65 Bay, Boston, Mass. ..... R F H
Bradford, Kyle & Co., Plymouth, Mass. ..... M
Cablex. See Collyer Insulated Wire Co.
Celatsite. See Acme Wire Co.
Collyer Insulated Wire Co., Pawtucket, R. I. ..... R F H
Colorbeston. See General Elec. Co.
Condex. See Simplex Wire Co.
Colorubber. See Belden Mfg. Co.
Copperweld Steel Co., Rankin, Pa. ..... R
Cotenamel. See Belden Mfg. Co.
Cottonite. See Acme Wire Co.
Crescent Ins. Wire & Cable Co., Trenton, N. J. ..... R F H A T M
Darow Mfg. Co., 97 Greene, New York, R
Davis-Jones Insulated Wire Co., Pawtucket, R. I. ..... R F H A T
Deltabeston. See York Insulated.
Detroit Insulated Wire Co., Detroit, Mich. R ..... T
Diamond Braiding Mills, Chicago Heights R F H .... M
Dreadnaught. See Indiana Rubber Co.
Driver-Harris Co., Harrison, N. J. ..... R .. H
Dudlo Mfg. Co., Div. of General Cable Corp., Fort Wayne, Ind. ..... M

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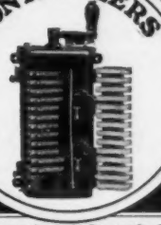

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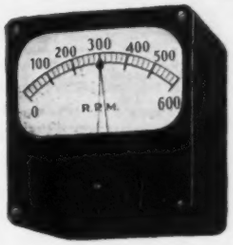

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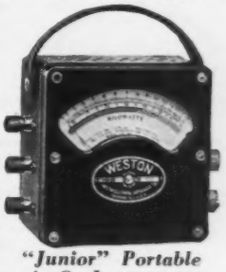

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Duracord. See Tubular Woven.
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Duro. See McEvoy, C. H.
Eagle. See Goldmark Co., James.
Eastern Insulated Wire Co., Tilton, N. H. R . . . . . .
1885. See Chicago Insulated Wire.
Enamelite. See Acme Wire Co.
Fibrex. See Simplex Wire Co.
Flexible Woven Cable Co., 755 Boylston, Boston, Mass. . . . . F . . . . . .
Flex-O-Cord. See Packard Elec. Co.
Garco. See General Asbestos Co.
Gavitt Mfg. Co., West Brookfield, Mass. . . . . T . .
GE-Flex. See General Elec. Co.
General Asbestos & Rubber Co., Charleston, S. C. . . . . H . . . . .
General Elec. Co., Section W-234, Merchandise Dept., Bridgeport, Conn. . . . R F H . . . M
Giant. See Callyer Insulated Wire.
Goldmark Co., James, 83 Warren, New York, Annunciator and Asbestos, Cotton, Silk and Enameled Magnet . . . . . A . . M
Goodyear Rubber Insulating. See Graybar Electric Co.
Graybar Elec. Co., Graybar Bldg., Lexington Ave. & 43rd St., New York, N. Y. R . . . . . T . .
Grimshaw. See New York Ins.
Hatex. See Hatfield Rubber Wks.
Hatfield Rubber Wks., Inc., Hillside, N. J. R . . H . . . . .
Hazard Insulated Wire Works, Div. of Okonite Co., Wilkes-Barre, Pa. . . . R F . . A . . .
Holyoke Co., 621 Broadway, New York . . R . . . . A . . M
Indiana Rubber & Insulated Wire Co., Jonesboro, Ind. . . . . R F H . . . . .
Inland Wire & Cable Co., Sycamore, Ill. R W . . A . . . M
I. X. L. See Collyer Insulated.
Kable. See Safety Cable Co.
Kenrite. See American Insulated.
Kerite Ins. Wire Cable Co., 30 Church, New York, N. Y. . . . . R . . . . . .
Kilo, Co., 2 E. 23d, New York. . . . . T M
Koelle, Frederick C., Real Estate Trust Bldg., Philadelphia, Pa. . . . . T . .
Lowell Insulated Wire Co., Lowell, Mass. R F H . . . . .
Liberty. See Nat. Metal Molding.
Loxsteel. See Hazard Insulated Wire Works.
McEvoy, C. H., Lowell, Mass. . . . . R . . . . . T . .
Maring Wire Co., Muskegon, Mich. Cotton, Silk, Enameled . . . . . M
Marion Insulated Wire & Rubber Co., Marion, Ind. . . . . R F H A T . .
Massachusetts Elec. Mfg. Co., West Lynn, Mass. . . . . M
Montgomery Co., J. R., Windsor Locks, Conn. . . . . T . .
National Elec. Products Corp., 1110 Fulton Bldg., Pittsburgh, Pa. . . . . R F H A T M
N. E. See Goldmark Co., James.
New York Insulated Wire Co., 114 Liberty, New York, N. Y. . . . . R . . . . . .
Nitro. See Belden Mfg. Co.
O. K. See Phillips Wire Co. Also Southern Cable Co.
Okocord. See Okonite Co.
Okonite Co., Passaic, N. J. . . . . R . . . . . .
Ozex. See Simplex Insulated Wire
Packard Electric Co., Warren, O. . . . . R F . . . . . .
Parsc. See Phillips Wire Co.
Paracore. See U. S. Rubber Co.
Paraflex. See Bishop Wire & Cable.
Paranite. See Indiana Rubber.
Parkerite. See Seward Wire Co.
Peco. See Packard Elec. Co.
Philadelphia Insulated Wire Co., 200 N. Third, Philadelphia, Pa. . . . . H A T . .
Phillips Wire Co., Pawtucket, R. I. . . . . R . . . . . .
Providence Insulated Wire Co., Providence R F H A . . . .
Raven Core. See New York.
Reliance. See American Steel.
Rockbestos Products Corp., Nicoll & Conner Sts., New Haven, Conn. . . . . R . . H . . T M
Roebling's Sons Co., John A., Trenton, N. J. . . . . R F H A T M
Rome Electrical Co., Rome, N. Y. . . . . M
Rome Wire Co., Rome, N. Y. . . . . R F H . . T M
Ross Wire Co., 69 Bath, Providence, R. I.. R . . . . . .
Rumsel-Lenz Elec. Mfg. Co., 1751 N. Western Ave., Chicago, Ill. . . . . T . .
Safety Cable Co. (Div. of General Cable Corp.), New York . . . . . R F H . . . . .
Salamander. See York Insulated.
Seward Wire Co., Parkersburg, W. Va. R . . . . . .
Silkenamel. See Belden Mfg. Co.
Silkenite. See Acme Wire Co.
Simcore. See Simplex Wire.
Simplex Wire & Cable Co., 63 Sydney, Cambridge, Mass. . . . . R F . . . . . .
Shield. See Ansonia Elec'l Co.
Southern States Cable Co., Div. of General Cable Corp., Mobile, Ala. . . . . M
Spiralweave. See Hazard Ins. Wire
Standard Alloy Wire Co., Elizabeth, N. J. . . . H . . . . .
Standard Insulated Wire Co., Westfield, Mass. . . . . R . . H . . . . .
Standard Underground Cable Co., Pittsburgh, Pa. (Div. of General Cable.) R F H A T . .
Sterling. See Standard Underground.
Sterling Insulated Wire Co., Fall River, Mass. . . . . R . . . . . .
Strand & Sweet Mfg. Co., Winsted, Conn. . . . . M
Super-Service. See Rome Wire Co.
Sweetstrand. See Strand & Sweet.
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Tirex. See Simplex Wire & Cable.
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Triangle Conduit Co., Dry Harbor Rd. & Cooper Ave., Brooklyn. . . . . R . . . . . .
Tubular Woven Fabric Co., Pawtucket, R. I. . . . . R F . . . . . .
United States Rubber Co., 1790 Broadway, New York, N. Y. . . . . R . . H A T . .
U. S. Royal. See United States.
Varflex Corp., Rome, N. Y. . . . . M
Warrior. See American Copper.
Wheeler Insulated Wire Co., Bridgeport, Conn. . . . . R F H A T M
White, J. M., 1128 Oliver, Philadelphia, Pa. . . . . R F H . . T . .
Whitney Blake Co. See Graybar Electric Co.
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Braiding Machines . . . . . See B
Bunching Machines . . . . . See B
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Park Cabling Machines . . . . . See A
Saturating Tanks . . . . . See F
Spooling Machines . . . . . See U
Stranding Machines . . . . . See B
Tinning Tanks . . . . . See F
Winding Reels . . . . . See U

Adamson Machine Co., Akron, Ohio.. I A . . . . . .
Aimco-Seward. See American Insulating Machinery Co.
American Insulating Machinery Co., 519 Huntington Ave., Philadelphia, Pa. I A . . . S U F
Breguet. See American Insulating
Crescent. See Royle & Sons, John.
Durant Mfg. Co., 662 Buffum, Milwaukee, Wis. . . . . M . . U . .
Housatonic Machine & Tool Co., Bridgeport, Conn. . . . . I . . . . . U . .
Minneapolis Elec. & Construction Co., 80 S. 12th St., Minneapolis, Minn. . . . . M . . U . .
Nebutteo. See New England Butt Co.
New England Butt Co., 324 Pearl, Providence, R. I. . . . . I A B M S U . .
Peerless. See Royle & Sons, John.
Royle & Sons, John, Paterson, N. J. I . . . . . .
Sleeper & Hartley, Inc., Worcester, Mass. . . . . A . . . . S U
Terkelson Machine Co., 326 A St., Boston, Mass. . . . . M . . . . .
Textile Machine Works, Reading, Pa. . . . B . . . . . .
Universal Wire Machy. Co., 69 Daggett, New Haven, Conn. . . . . A . . . . . U F
Utility Mfg. Co., Cudahy, Wis. . . . . I . . . . . .
Wardwell Braiding Machine Co., Central Falls, R. I. . . . . B . . . . . .
Watson Mfg Co., Paterson, N. J.. I A . . M S . . F
Wire Machinery Corp. of Am., New Haven, Conn. . . . . M S U . .
Weir. See Housatonic Machine

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Boxes. See Cabinets & Boxes, Wood
Cabinets. See Cabinets & Boxes, Wood
Pulleys. See Pulleys, Composition.
Woods Metal. See Radio Mountings.

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Smith & Dove Mfg. Co., Andover, Mass. (Linen Thread.)
Worcester Bleach & Dye Wks., Worcester, Mass.

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Horse Head. See New Jersey Zinc Sales Co.
New Jersey Zinc Sales Co., 160 Front, New York, N. Y.
Platt Bros. & Co., Waterbury, Conn. (Strips.)

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Edes Mfg. Co., Plymouth, Mass.
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Franklin. See Grasselli Chemical Co.
Grasselli Chemical Co., Guardian Bldg., Cleveland, O.
Illinois Zinc Co., Peru, Ill.
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"Blaisdell" Automatic Electric Cigar Lighter
"L. R. Co." Receptacles
"Lily Wilson" Vacuum Cleaner
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"Perkins" Siren
"Flint" Waffle Iron
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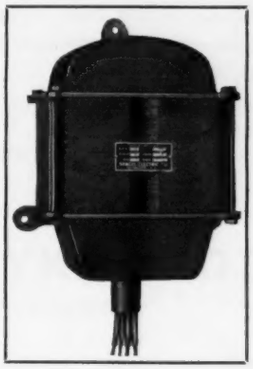

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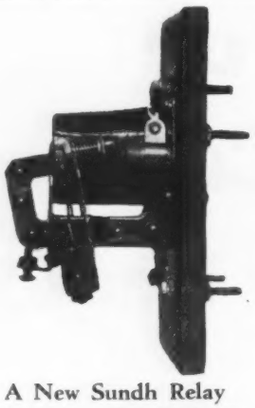
Sundh *Special* Control designed today becomes *Standard* tomorrow



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This relay is manufactured in two capacities, 3 and 6 amperes, for all voltages, 6 to 550 volts, either A.C. or D.C., and is made in 1, 2, 3 and 4 poles; 2-pole double throw, also with 1 or 2 poles, normally closed with 1 or 2 poles normally open, using one magnet.

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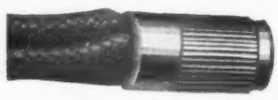

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Pin-Plug Connectors

for ELECTRICAL APPLIANCES

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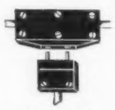

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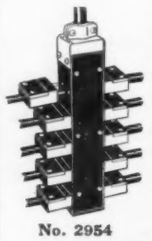

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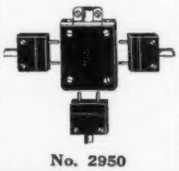

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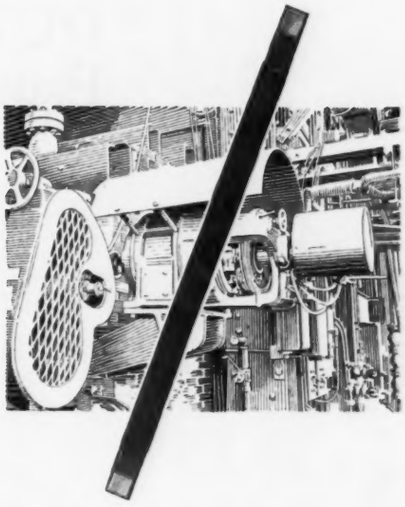

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YI-2

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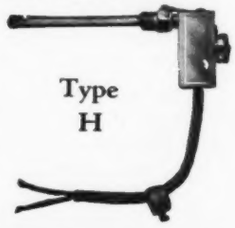

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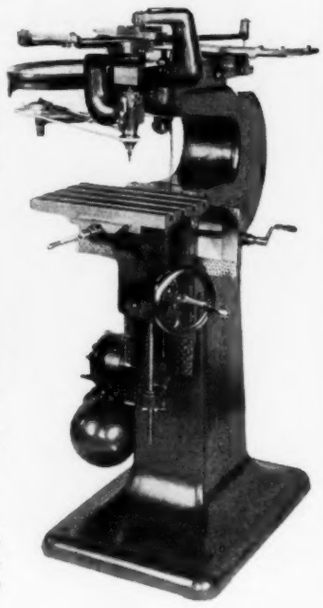

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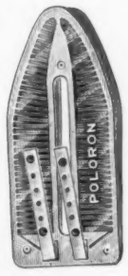

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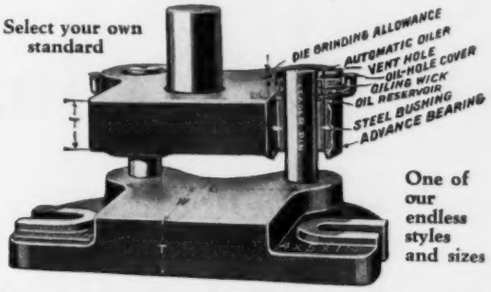

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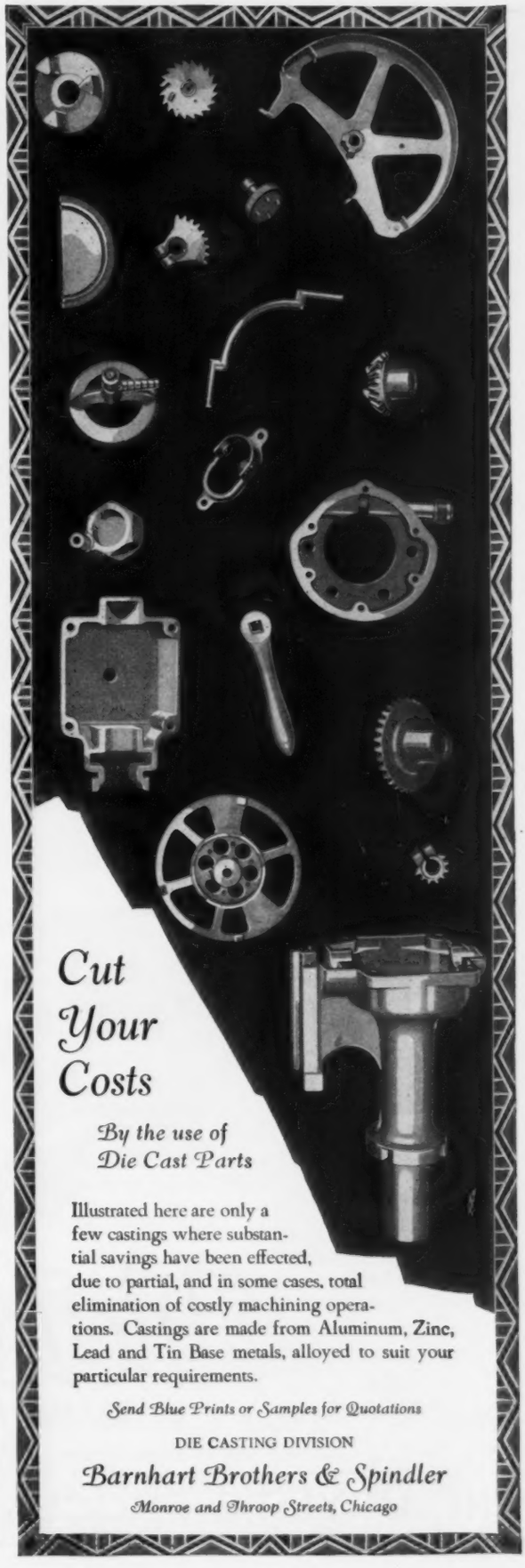

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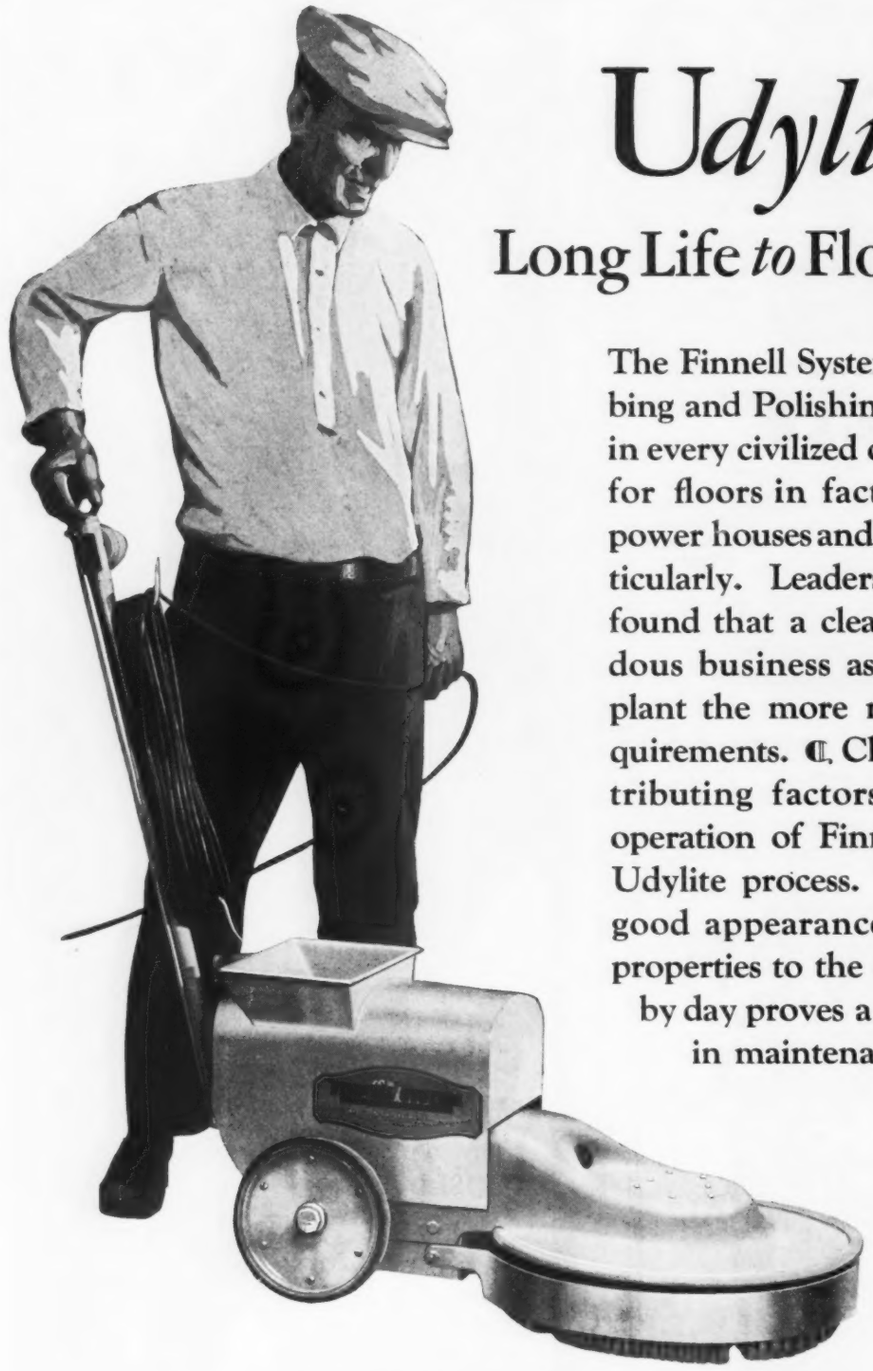

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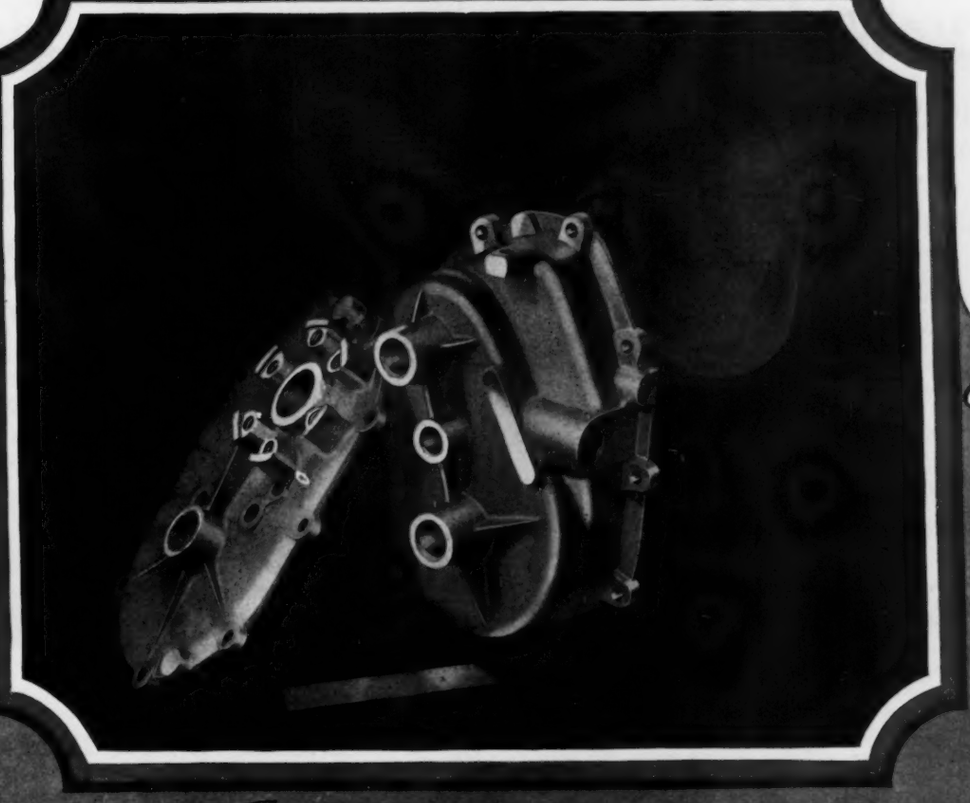

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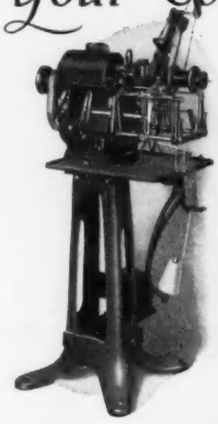

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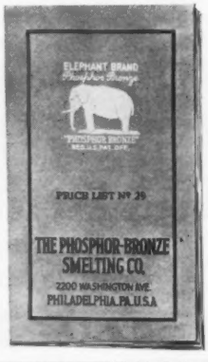

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The most modern buildings Athey Shaded are renting easier. 27 buildings in Detroit recently equipped.

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Radio coils and condensers treated in the

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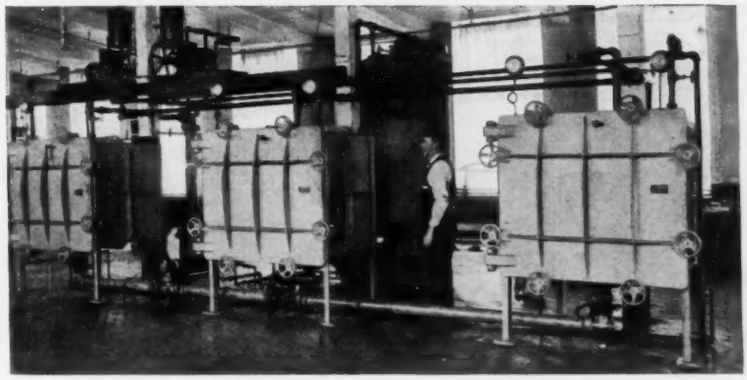

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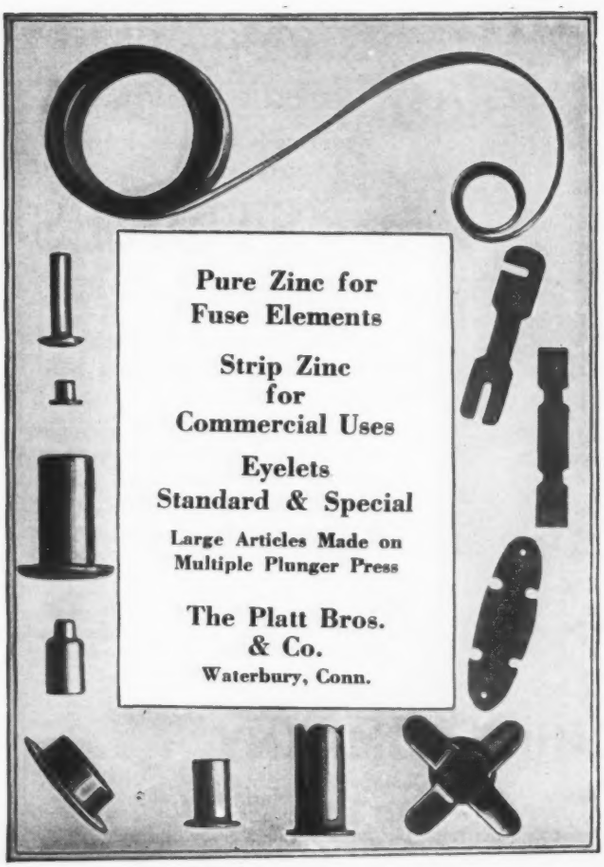

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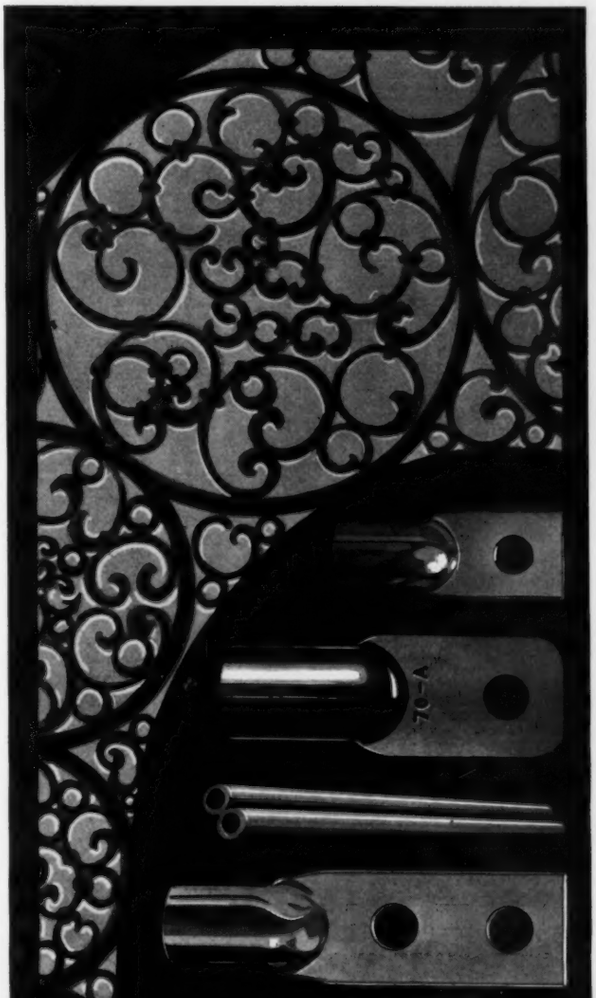

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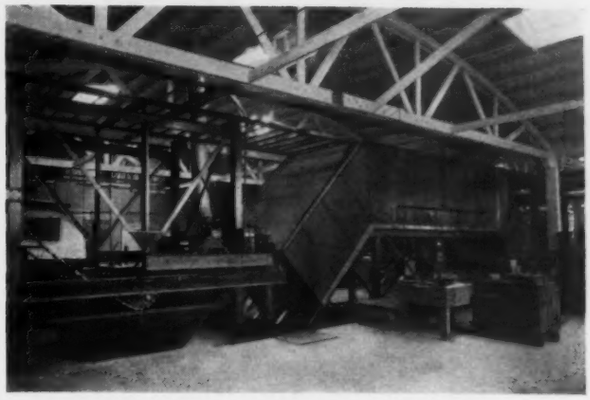

Oven Pays for Itself In Eighteen Months

THE actual saving in fuel and labor in the first eighteen months after this continuous conveyor japanning oven went into commission were equivalent to the total initial cost of the installation.

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The economy of good finishing equipment is measured in actual dollars and cents and in the improved quality of finish. In planning cost reductions in your finishing department, the suggestions and experience of Young Brothers Engineers will save you a great deal of time and in developing your ideas.

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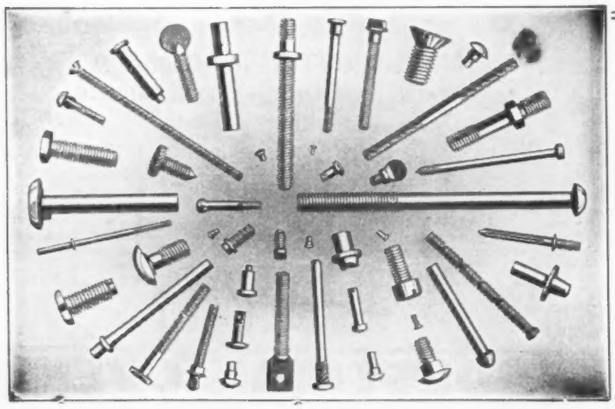

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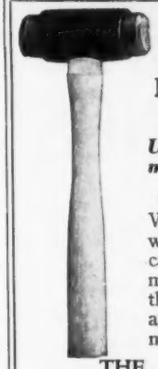

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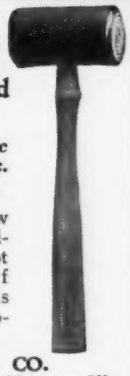
Saves Battered-Up Motor Parts

Will transmit an effective blow without damage to the most delicate surface. The blow is not more destructive to the tool itself than to the object to which it is applied—therefore, doubly economical.



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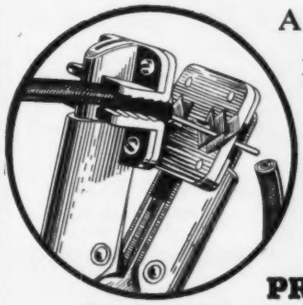

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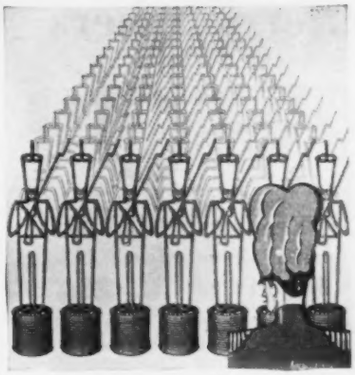

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SWORN foes of the high production costs that raid your profits! Defenders of your quality and reputation! Modern strategy, recognizing the inability of solder and flux as individuals to combat high costs, now offers you an alliance of these two units in more efficient form — KESTER CORED SOLDERS.

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Manufacturers are invited to submit their soldering problems to P. C. Ripley, chief of our engineering staff. We maintain a laboratory to solve just such individual needs. Write for further information and Mr. Ripley's book, "Facts on Soldering" stating the products you manufacture.

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Lower your production cost—increase your output
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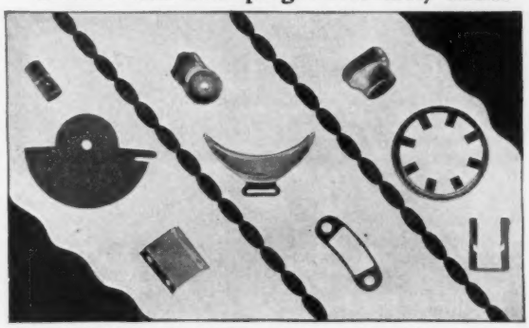

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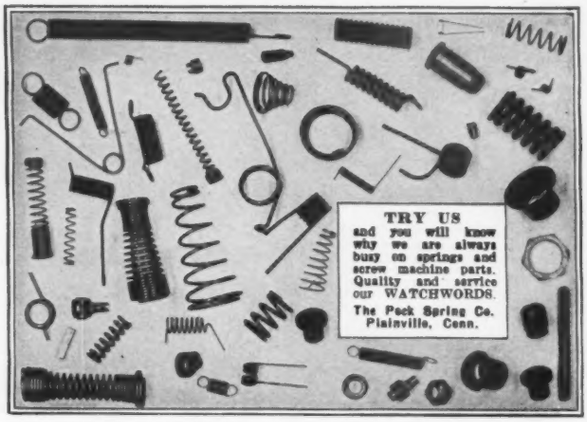
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and you will know why we are always busy on springs and screw machine parts. Quality and service our WATCHWORDS.
The Peck Spring Co.
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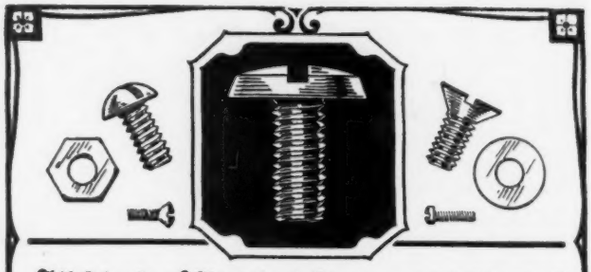

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For all electrical and mechanical manufacturing purposes. All specifications as to quantity and quality are accurately met. Our prices are right and delivery prompt.

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. . . service on a quantity production basis in screw machine work.
Metal parts for radio condensers, metal inserts for moulded products — countless other items. Send sample or sketch for estimates. Our prices are not the lowest but we guarantee the quality of our workmanship.
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LACQUERS ENAMELS

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Rapid advances in Radio Models and refinements of parts likewise require Lacquer Materials designed "up to the minute" and in pace with this fast-moving industry.

Some of these "custom-made" M. & W. Lacquer products include—

BLACK INSULATING ENAMEL
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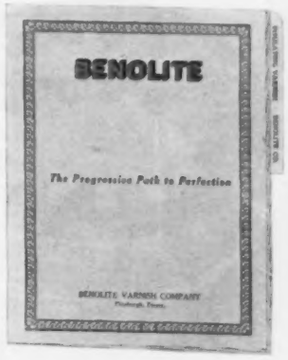
No one type of insulating varnish should be expected to serve *all* purposes



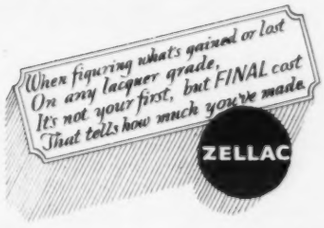
Benolite's book on the many applications of insulating varnishes will show you what kind of a varnish to use for a specific job. Send for it today.

Benolite Varnish Company, Pittsburgh, Pa.

Benolite
INSULATING VARNISHES

LACQUER IT WITH ZELLAC

Don't Ask a Boy to Do a Man's Job!


When figuring what's gained or lost
On any lacquer grade,
It's not your first, but FINAL cost
That tells how much you've made.
ZELLAC

EVEN low-priced lacquers must deliver *some* value—but *cheap* lacquers never reduce costs! Your labor remains the same in any case. The cheap lacquer requires extra coats—or other compromises equally expensive.

Don't try to determine your finishing costs on a price-per-gallon basis. Figure them the Zellac way—finishing economy as proved by *final* costs— plus the increased salability of your finished product. Test Zellac with a grade *specifically formulated to meet your requirements*—then judge Zellac prices according to Zellac results. Send for a trial order, giving complete description of your finishing needs, and let us help you prove the point to your own satisfaction.

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FOR EVERY INDUSTRIAL PURPOSE

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successfully resists destructive "Corona" action

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Send for this FREE sample booklet, and make your own tests

We also make

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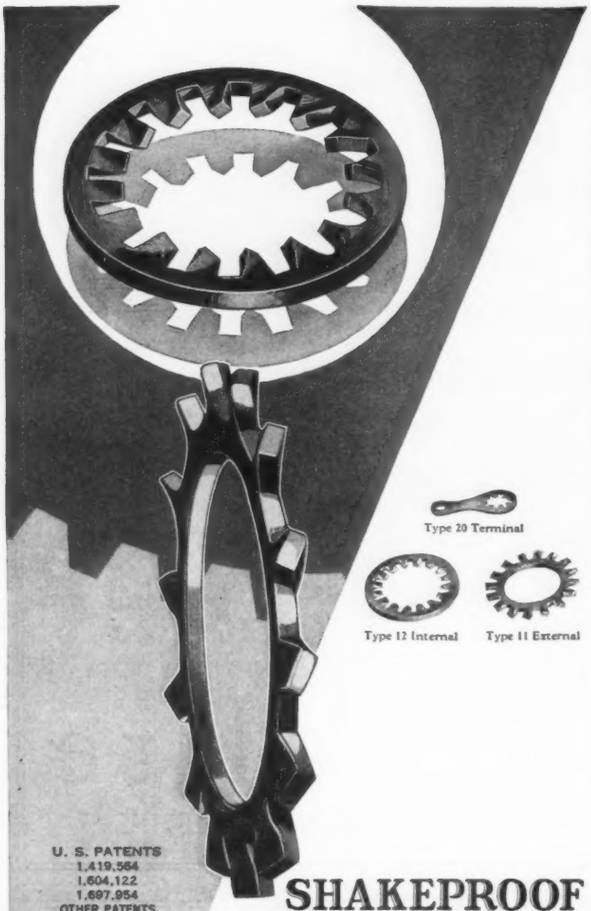

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Regardless of your locking problem—Shakeproof will do the job better at a saving in time. The twisted teeth bite into both the nut and the work, forming a multiple lock around the whole circumference. They cannot tangle or spread. Mail the coupon for samples and test them in your own plant.

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Shakeproof Lock Washer Co., 2513 N. Keeler Ave., Chicago, Ill.
Please send me samples of
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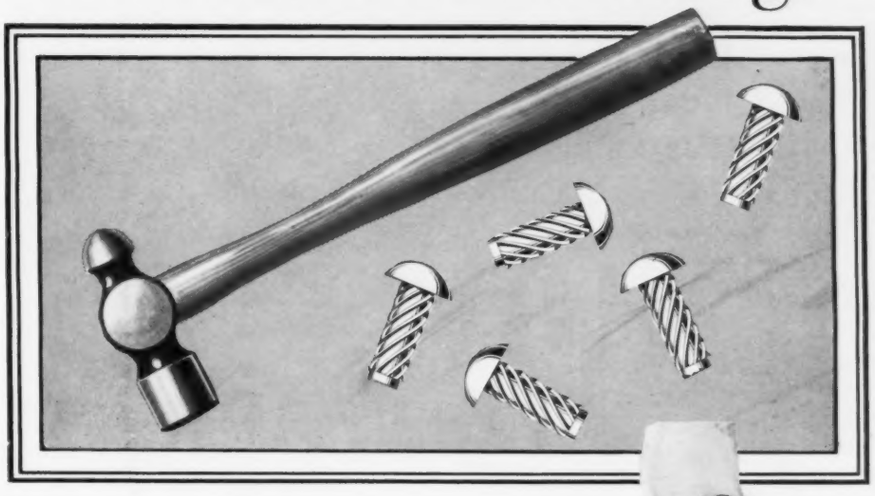
Electrical Manufacturing

All You Need to make Permanent Fastenings



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A HAMMER and some Hardened Metallic Drive Screws are all you need to make permanent fastenings to iron, brass and aluminum castings, steel, Bakelite, etc. No taps or tapping machinery necessary. A Hardened Metallic Drive Screw is its own tap—cuts a thread as you hammer it in a drilled hole.

Compare the ease, speed and economy of making fastenings this simple way with other methods of assembly. Then remember that these unique screws have proven their ability to hold under vibration and severe service conditions.

Leading manufacturers of electrical products of every description have made considerable reduction in time and cost of assemblies by using these Screws in place of machine screws, escutcheon pins, rivets, etc.

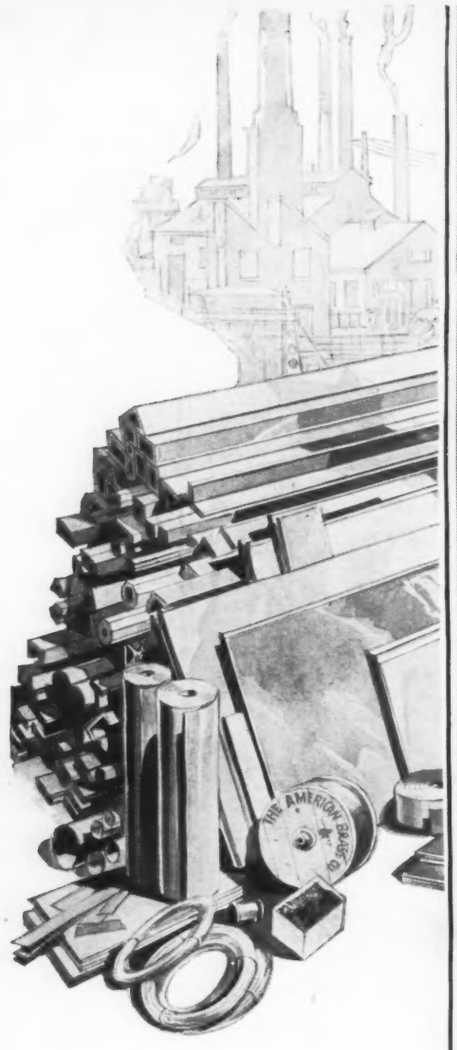
Such concerns as General Electric Co. and Westinghouse Electric and Manufacturing Company tested samples of these Screws and saved by adopting them. We want you to try them too. Tell us what you want to fasten—we'll send suitable samples.

PARKER-KALON CORPORATION
190 Varick Street New York. N. Y.

Distributed in Canada by Aikenhead Hardware, Ltd., 19-21 Temperance St., Toronto

Parker-Kalon
TRADE MARK
Hardened Metallic
REG. U.S. PAT. OFF.
Drive Screws

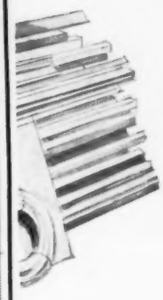
PATENTED JAN. 29, 1924 - No. 1482151
OTHERS PENDING



There is usually one best metal for every manufacturing requirement. The American Brass Company, through its Technical Department, is prepared to help determine what this metal is, and if the need is met most advantageously with copper or an alloy of copper, to supply the metal in uniform, dependable quality

ANACONDA COPPER *and* COPPER ALLOYS

—in all commercial shapes for manufacturing requirements



The American Brass Company embodies in Anaconda Copper, Brass and Bronze Products the highest technical skill in manufacture, with an accumulated knowledge and experience of more than a century. Anaconda Metal Products for the Electrical Industry include:

Sheets, Rolls and Strips	Copper, Nickel Silver, Phosphor Bronze, Brass, Everdur Metal, Special Alloys
Wire Products	Magnet Wire—cotton covered Office and Annunciator Wire Resistance Wire—Nickel Silver Spring Wire — Phosphor Bronze, Silicon Bronze and Everdur Metal Fine wire on spools for electrical purposes
Rods and Bars	Copper, Brass, Phosphor Bronze, Everdur Metal, Free Turning Brass, Special Alloys, Commutator Bars and Segments Bus Bars—High conductivity Copper (guaranteed 99%) cold drawn to dimensions Welding Rods—Tobin Bronze, Everdur, and Phosphor Bronze. Special Alloys
Tubes	Copper, Brass and Special Alloys Phosphor Bronze—for bushings, etc. Bus Tubes—High conductivity Copper—Special grades for bending, flanging and expanding
Special Products	Fancy Pattern, Sheets and Tubes Die Pressed Parts—Wrought Brass, Copper and High Tensile Strength Bronze—Furnished to specifications Extruded Shapes Anodes Rivets and Burs

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